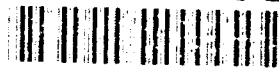


AD-A264 924



WHOI-91-42

(1)

**Woods Hole
Oceanographic
Institution**

DTIC
ELECTE
MAY 26 1993
S A D



**United States Electronic Chart Display and
Information System (ECDIS) Test-Bed Project:
System Requirements Specification.**

edited by:

Carolyn K. Ocel and David J. Scott

August 1991

Technical Report

Funding was provided by the U.S. Coast Guard, the American Petroleum Institute, American Telephone and Telegraph, Exxon Shipping Company, and the Marine Spill Response Corporation. In-kind contributions are coming from the National Ocean Service (NOAA), Raytheon Marine Company, RACAL Marine Electronics, Ltd., COMSAT Maritime Services, and American President Lines.

Approved for public release; distribution unlimited.

9 3 5 25 11 4

93-11676



WHOI-91-42

**United States Electronic Chart Display and
Information System (ECDIS) Test-Bed Project:
System Requirements Specification.**

edited by:

Carolyn K. Ocel and David J. Scott

Woods Hole Oceanographic Institution
Woods Hole, Massachusetts 02543

August 1991


Technical Report

Funding was provided by the U.S. Coast Guard, the American Petroleum Institute, American Telephone and Telegraph, Exxon Shipping Company, and the Marine Spill Response Corporation. In-kind contributions are coming from the National Ocean Service (NOAA), Raytheon Marine Company, RACAL Marine Electronics, Ltd., COMSAT Maritime Services, and American President Lines.

Reproduction in whole or in part is permitted for any purpose of the United States Government. This report should be cited as Woods Hole Oceanog. Inst. Tech. Rept., WHOI-91-42.

Approved for public release; distribution unlimited.

Approved for Distribution:


James M. Broadus
Marine Policy Center

Accession For	
NTIS CRA&I	<input checked="" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A-1	

Preface

In 1989 the Maritime Safety Committee (MSC) of the International Maritime Organization (IMO) adopted a provisional performance Standard for ECDIS (MSC/Circ. 515). This standard defines an electronic chart display and information system (ECDIS) that is the legal equivalent of a paper chart, and that fulfills the requirement imposed on all vessels (reg. V/20 of SOLAS 1974) to carry up-to-date nautical charts covering intended voyages.

The U.S. Electronic Chart Display and Information System (ECDIS) Test-Bed Project began as a collaborative effort between the Radio Technical Commission for Maritime Services (RTCM) and the Woods Hole Oceanographic Institution (WHOI) in 1990. The project responds to the International Maritime Organization (IMO) call to member states to evaluate its Provisional Performance Standards for ECDIS. Since 1990 the U.S. ECDIS Test-Bed Project has grown in participation through sponsorship and in-kind contributions from government and private organizations, through collaboration with organizations in other nations, and through contractual arrangements with private companies.

The central objective of the ECDIS Test-Bed Project is to assemble an experimental ECDIS unit that meets or exceeds the IMO standard, for evaluation on ships at sea. The first part of the project focussed on translating the IMO Provisional Performance Standard into an ECDIS system requirement specification, describing in an engineering context what an ECDIS must do to meet the standard. This task began with a document written by Mr. Mortimer Rogoff, of Digital Directions Co., and was carried to full detail and documentation by Ms. Carolyn K. Ocel and Mr. David J. Scott, of Intergraph Corporation. Their work was reviewed by members of the Consultative Group, the advisory body to our Project. The result of this process is contained in this report.

Details of this ECDIS System Requirement Specification (SRS) will no doubt be disputed, as ambiguities, inherent contradictions, and priorities of various interested parties become manifest. This is an expected part of the standard setting process and we welcome it. Written comments on this SRS are particularly welcome and should be addressed to me. Subsequent stages of the project involve preparation of the system design document; software development and hardware integration; system testing and acceptance; and sea trials.

Introduction of ECDIS technology into maritime transportation represents a breakthrough in maritime safety, environmental protection and, probably, cost savings in ship operation. Applications of this enabling technology will reach into vessel traffic monitoring and control, maritime law enforcement (e.g., fisheries), marine resources survey and management, ocean research, and other applications.

The ECDIS Test-Bed Project is funded by the U.S. Coast Guard, the American Petroleum Institute, American Telephone and Telegraph, Exxon Shipping Company, and the Marine Spill Response Corporation. In-kind contributions are coming from the National Ocean Service (NOAA), Raytheon Marine Company, RACAL Marine Electronics, Ltd., COMSAT Maritime Services, and American President Lines.

Arthur G. Gaines, Jr.
ECDIS General Program Manager
Marine Policy Center
Woods Hole Oceanographic Institution
Woods Hole, Massachusetts 02543

TABLE OF CONTENTS

I. Introduction	1
II. Applicable Documents	3
III. Executive Summary	5
IV. Requirements Definition	7
1. ELECTRONIC NAVIGATION CHART (ENC) DATA MANAGEMENT	8
2. GENERAL REQUIREMENTS FOR ECDIS UPDATING	11
3. ELECTRONIC NAVIGATION CHART (ENC) UPDATE	14
4. MANAGEMENT OF SUPPLEMENTARY DATA	24
5. UPDATES TO NAVIGATION PUBLICATIONS DATA	33
6. RADIO WARNING DATA MANAGEMENT	39
7. SYSTEM ELECTRONIC NAVIGATION CHART (SENC) GENERATION	41
8. SYSTEM ELECTRONIC NAVIGATION CHART (SENC) DISPLAY	44
9. SYSTEM ELECTRONIC NAVIGATION CHART (SENC) MANIPULATION	76
10. ROUTE PLANNING	80
11. ROUTE MONITORING	93
12. HISTORY TRACKING	103
13. CALCULATIONS, MEASUREMENTS, AND COMPUTATIONS	105
14. INDEXES, CATALOG, AND LIBRARY MANAGEMENT	114
15. USER INTERFACE	119
16. ON-BOARD SYSTEMS INTERFACES	121
17. SYSTEM INITIALIZATION	139
18. SYSTEM BACKUP/RESTORE	147
19. SYSTEM ACCESS/SECURITY	149

August 1, 1991

ECDIS SRS/Version 2.2

20. POWER SUPPLY	151
21. MALFUNCTIONS.	152
V. Document History	154
APPENDIX A: Notes on Test-bed TBRs	155
APPENDIX B: Requirements Index	161
APPENDIX C: Glossary of Terms and Acronyms	185
APPENDIX D: SRS Comment Form	188
APPENDIX E: Mapping of Default Display Objects to IMO List of Default Display Items	189

August 1, 1991

ECDIS SRS/Version 2.2

**UNITED STATES
ELECTRONIC CHART DISPLAY AND INFORMATION SYSTEM (ECDIS)
TEST-BED PROJECT**

SYSTEM REQUIREMENT SPECIFICATION (SRS)

Version 2.2

August 1, 1991

EDITED BY:

**Carolyn K. Ocel
David J. Scott
Intergraph Corporation
2051 Mercator Drive
Reston, VA 22091**

I. Introduction

A.1 Scope

The Electronic Chart Display and Information System (ECDIS) System Requirements Specification (SRS) fulfills the following functions within the United States ECDIS Test-Bed Project:

- o Enumerates requirements that describe functionality required within the U.S. ECDIS Test-Bed System to test all critical elements of the IMO Provisional ECDIS Standard ("Provisional Performance Standards for Electronic Chart Display Systems (ECDIS)", Maritime Safety Committee Circular 515, International Maritime Organization, dated April 13, 1989.)
- o Enumerates requirements that describe functionality desired within the U.S. ECDIS Test-Bed System to test elements of ECDIS systems not embodied within the above mentioned IMO standard but considered critical to the U.S. evaluation of their potential to support safe navigation.
- o Supports the design and development of the U.S. ECDIS Test-Bed System.
- o Supports multi-organization U.S. coordination of the specification.
- o Traces ECDIS requirements to their source.
- o Provides commentary on requirements as appropriate.

A.2 Audience

The intended users of this SRS are:

- o Organizations and individuals coordinating the U.S. evaluation of the ECDIS standard
- o Organizations and individuals conducting the evaluation of this document
- o Organizations developing the U.S. ECDIS Test-Bed System
- o Organizations supporting the U.S. test of ECDIS standard
- o Interested U.S. and international parties

A.3 Organization

This SRS is organized, structured, and maintained as described in the following paragraphs.

A.3.1 Document Organization

The ECDIS SRS is organized into five (5) sections as described below:

- o Section I contains introductory material for the ECDIS SRS.
- o Section II lists documents utilized in the development of the ECDIS SRS.
- o Section III provides an executive summary of the ECDIS program and the U.S. ECDIS Test-Bed Project.
- o Sections IV details U.S. ECDIS Test-Bed System functional, interface, and performance requirements.
- o Section V provides a chronological document history.

A.3.2 Requirement Definition

The requirements contained in section IV of this SRS are a collaborative effort involving many different organizations and individuals involved in the specification and definition of ECDIS. Requirements have been constructed by gathering statements from these sources and previous bodies of ECDIS work. In addition, requirements are drawn from the supporting standards as appropriate. All sources utilized in development of the SRS are detailed in section II.

A.3.3 Requirement Structure

ECDIS Test and Demonstration System requirements are defined in this SRS in a hierarchy representing levels of abstraction or detail. Requirements are broken down until the system is defined at the lowest level of abstraction and highest level of specificity required to support development.

To assure the complete capture of ECDIS requirements, each requirement is tracked to its source. This is done by annotating each requirement as follows:

- o For requirements extracted directly from the IMO ECDIS standard or other applicable ECDIS related standards and documents, the requirement is referenced to its specific source document by utilizing the annotation "[2.X, page N, paragraph M]" following the requirement statement. In this construct, "X" is the position of the document in the "Applicable Documents" section of the SRS, "N" is the page number of the source document from which the requirement was extracted, and "M" is the paragraph number in which the requirement appeared. In cases when a specific SRS requirement may be traced to multiple source documents, all references are included in the annotation and separated by semi-colons. (e.g. - [2.1, page 5, paragraph 3.6; 2.2, page 10, paragraph 4.5])
- o In cases when a requirement is directly derived from a statement made in a source document, the same annotation described above is used, with the addition of term "derived," as follows: "[Derived, 2.X, page N, paragraph M]".
- o For those requirements derived in the process of developing this SRS without the benefit of an explicit source, no annotation is provided.

A.3.4 Notes on Test-bed TBRs

During the development of the SRS, there were occasions in which the authors or evaluators felt it necessary to provide an explanatory comment or clarification regarding a particular U.S. ECDIS Test-Bed System requirement. These comments and clarifications are included in Appendix A to this SRS and referenced within the body of the SRS using the notation "(see note M)"; where M denotes the note number as it appears within appendix A.

A.3.5 Items "To Be Resolved" (TBR)

During the development of the SRS, circumstances arise in which the exact specification detail required to complete a requirement statement is unknown or unavailable. In these circumstances, items are marked as "(TBR)" indicating they are "to be resolved" at later date.

A.3.6 Requirements Index

Appendix B contains an index to all ECDIS requirements stated in section IV.

A.3.7 Glossary of Terms

Appendix C contains a glossary of terms relevant to the material contained in this document.

A.3.8 Requirements Comment Form

Appendix D contains a form that may be used to provide comments on requirements enumerated in this document.

A.3.9 Mapping of Default Display Objects to IMO Default Display Items

Appendix E contains the mapping of default display items listed in the IMO Provisional Standard to the IHO object catalogue to the extent possible.

A.3.10 Document Revision

Revisions to this document are annotated with a two level version numbering scheme (N.M); N representing the major number and M representing the minor number. Addition of new material or changes will be noted as follows:

- o New material will be indicated by a vertical "change bar" in the left margin of the text.
- o Material to be deleted will show a "strike through" in version N.M+1 and will be removed completely in version N.M+2 of the SRS.

Section V contains a revision history of the SRS.

II. Applicable Documents

The following documents were utilized in the development of the requirements detailed in this SRS.

August 1, 1991

ECDIS SRS/Version 2.2

- 2.1 "Provisional Performance Standards for Electronic Chart Display Systems (ECDIS)," Maritime Safety Committee Circular 515, International Maritime Organization, dated April 13, 1989.
- 2.2 "Provisional Specifications for Chart Content and Display of ECDIS," Special Publication No. 52, International Hydrographic Organization - COE Working Group, May 1990.
- 2.3 "Report of the IHO (COE) Working Group on Updating the Electronic Chart," Special Publication No. 52, Appendix 1 International Hydrographic Organization, Committee on ECDIS Working Group, June, 1990.
- 2.4 "Provisional Presentation Standards for ECDIS," Appendix 2 to IHO Special Publication No. 52, International Hydrographic Organization - COE Working Group on Colours and Symbols, June 1990, Revised October 1990.
- 2.5 "RTCM Provisional Standards For Electronic Chart Display and Information Systems," RTCM Paper 120-89/SC 109-71/BD-190, undated.
- 2.6 "The ECDIS Test and Demonstration Project in the United States," Mortimer Rogoff, August 9, 1990.
- 2.7 "Provisional Test Plan for the United States ECDIS Test and Demonstration Project," Mortimer Rogoff, December, 1990.
- 2.8 "Statement of Work for ECDIS Test and Demonstration Project," Draft for Comment, Mortimer Rogoff, January 29, 1990.
- 2.9 "U.S. ECDIS Test Bed Project Guidance Document," Mortimer Rogoff, January, 1991.
- 2.10 "RTCM Recommended Standards for Updating Electronic Charts," First Draft, June 17, 1988.
- 2.11 "IHO DX-90: Specifications for the Exchange of Digital Hydrographic Data - 1990," Version 1.3, Working Draft as of September 19, 1990, Committee on the Exchange of Digital Data; International Hydrographic Organization.
- 2.12 "IHO DX-90: Object Catalog, Release 1.0, Working Draft as of May, 1990, Committee on the Exchange of Digital Data; International Hydrographic Organization.
- 2.13 "International Chart Series INT 1 Symbols, Abbreviations, Terms Used on Charts," Deutsches Hydrographisches Institut, Hamburg, 1989.
- 2.14 "Standard for Interfacing Marine Electronic Navigational Devices," Version 1.5, December 1987, January 1990 printing, National Marine Electronics Association.
- 2.15 "Amendments of March 1991 to 'Provisional Presentation Standards for ECDIS' (Appendix 2 to IHO SP 52)", IHO Colours and Symbols Working Group.

August 1, 1991

ECDIS SRS/Version 2.2

- 2.16 Notes by the Government of Canada on "MSC/Circ 515 (13 April 1989) Provisional Performance Standards for ECDIS", presented at meeting of IMO/IHOHGE, March 1991.
- 2.17 "Updating for the Electronic Chart Display System" created for Special Committee 109 of RTCM by the Working Group on Updating, undated.
- 2.18 "System Requirements Specification (SRS) Comments on "TO BE RESOLVED" (TBR) items", Memorandum by Mortimer Rogoff, July 1, 1991.

III. Executive Summary

The Maritime Safety Committee (MSC) of the International Maritime Organization (IMO) adopted a provisional performance standard for ECDIS in 1989 (MSC/Circ. 515). This standard defines an electronic chart and display system (ECDIS) that is the legal equivalent of a paper chart, thus fulfilling the requirement imposed on all vessels (regulation V/20 of SOLAS 1974) to carry up-to-date nautical chart(s) that cover the routes of intended voyages.

Among the provisions of the IMO Provisional Standard is one that asks member governments to make trials and assess its provisions in preparation for the issue of a final version of the standard, tentatively set for 1993.

The U.S. ECDIS Test-Bed Project is a coordinated activity, currently underway in the United States, that will lead to the construction and operation of an ECDIS test facility. This project is being performed in response to direction from the IMO. The facility will be used in trials conducted in a number of geographic areas on board government and other vessels. The equipment and computer programs utilized in the test facility are intended to have sufficient capacity and levels of performance to be able to test all of the ECDIS features required by the Provisional Standard for ECDIS, and to test additional features not specified in the standard, but which may prove to be useful. A report and recommendations will be issued at the end of the trials, partly to supply an evaluation to IMO, and to assist in the preparation of national rules concerning the use of ECDIS in the United States.

The approach being taken to facilitate the ECDIS trials in the United States is based on the philosophy that existing ECDIS or ECDIS-like equipment will not be used; rather, a system is being constructed from graphics workstation and digital radar components whose performance exceeds the requirements of the Provisional Standard. The goal is not to produce a new production prototype, but to provide an experimental facility that tests the features displayed to the user without particular regard to the producibility of the system that creates the displays (or prematurely defined performance requirements).

The U.S. ECDIS Test-Bed Project in the United States was first described in a proposal prepared by the Radio Technical Commission for Maritime Services (RTCM) during 1989. The Woods Hole Oceanographic Institution (WHOI) joined with RTCM in this matter and agreed to serve as the Project Administrator for purposes of assembling financial contributions from government and industry, and to provide project management and administration.

During 1989 and 1990, a Statement of Work and proposed budget for the project was prepared, and became the basis for its funding and for the selection of vendors to supply the necessary equipment and computer programs. Contributions were sought, and are being received from both government and industry sources. These include the United States Coast Guard.

August 1, 1991

ECDIS SRS/Version 2.2

National Ocean Service, the American Petroleum Institute, American Telephone and Telegraph, and the Exxon Shipping Company.

The objectives of the Test and Demonstration Project can be stated as follows:

- o To construct and install a facility placed on board ship for testing, demonstrating and evaluating the provisions of the IMO Provisional Standard for ECDIS. In addition, to test, demonstrate and evaluate ECDIS features not contained in the IMO Provisional Standard, or which are mentioned as options.
- o To use as observers and participants in the trials, various members of the maritime community so as to obtain broad exposure of the use of ECDIS in various locations and under various types and conditions of maritime operations. Participants will include masters, mates, pilots, hydrographers, Coast Guard officers and other government officials, representatives of shipping companies, yachtsmen, fisherman, insurance underwriters, etc.
- o To provide the National Ocean Service (NOS) with a facility to evaluate the electronic chart displays produced from their chart database, and to assess changes that might be desirable in the content or format of that database to meet the needs of ECDIS.
- o To provide the Coast Guard with data, test results, and reports from which recommendations can be created and comments written concerning the United States evaluation of the IMO Provisional ECDIS Standard.
- o To provide the Coast Guard with data and at-sea experience useful in preparing regulations for the use of ECDIS in United States waters by foreign and domestic shipping.
- o To provide the maritime electronics industry with an ECDIS model that demonstrates features of the IMO Provisional Standard; also, to provide the industry with copies of the software for use in their own demonstrations.
- o To provide shipping companies with the ability to replicate the shipboard test facility and to install a similar system on their own vessels.
- o To provide the basis for future simulation, test, and training operations concerning the use of ECDIS in maritime operations.

The tentative program schedule calls for completion of the shipboard system before the end of 1991, with trials taking place in a number of harbors during much of 1992. Reports will be written in time for submission to IMO for evaluation of the Provisional Performance Standard due for final issue in 1993. [Reference 2.6]

IV. Requirements Definition

This section of the SRS contains functional, interface and performance requirements for the ECDIS system.

NOTE

REQUIREMENT TITLES WHICH ARE UNDERLINED IDENTIFY REQUIREMENTS WHICH ARE TO BE INCLUDED IN THE PHASE II DELIVERY OF ECDIS.

1. ELECTRONIC NAVIGATION CHART (ENC) DATA MANAGEMENT

1.1 ENC Loading

1.1.1 Input from Distribution Media

ECDIS shall provide the capability to read ENC data from 5 1/4" diskettes from the Hydrographic Authority and convert it to the internal storage format. [Derived, 2.10, page 7, paragraph 2.2]

(see note 194)

1.1.2 Use of IHO DX-90 Exchange Standard

ECDIS shall provide the capability to translate ENC data, structured and formatted as described in IHO DX-90 standard, to internal format, and then back to HO format.

1.1.3 Feature/Attribute Data Loading

ECDIS shall provide the capability to process ENC data consisting of features and attributes as specified in the IHO Object Catalogue. [Derived, 2.2, page 9, paragraph 5.3; page 10, paragraph 5.5]

1.1.4 ENC Data Dictionary Loading

ECDIS shall provide the capability to process ENC data dictionaries as described in the IHO Object Catalogue. [Derived, 2.2, page 9, paragraph 5.3; page 10, paragraph 5.5]

1.1.5 Meta-Data Loading

ECDIS shall provide the capability to process ENC meta-data (descriptive data) as described in the IHO DX-90 specification. [Derived, 2.2, page 9, paragraph 5.3; page 10, paragraph 5.5]

1.1.6 Verification Mechanism

1.1.6.1 Load Verification

ECDIS shall provide the capability to verify that ENC data has been loaded into the system. [2.1, page III, paragraph 3.6]

1.1.6.2 Display Verification

ECDIS shall provide the capability to verify that ENC data is being displayed without corruption on the EC display. (2.1. page III. paragraph 3.6)

1.1.7 Validation of Translations

ECDIS shall provide the capability to validate that ENC data has been translated to internal format, and then back to the HO format with no loss of precision and no change in

information content of the original data. [Derived, 2.2, page 12, paragraph 6.2.5; 2.10, page 7, paragraph 2.2]

1.1.8 Maintenance of ENC Access

ECDIS shall provide the capability to access the original ENC data at any time after the initial load and processing of the data to aid in verification and validation. [Derived, 2.2, page 12, paragraph 6.2.5]

1.1.9 Conformance of ENC to HO Standard

ECDIS shall provide the capability to ensure that a converted data set is certified to meet the same HO standards as the data contained on the master EC disk.[2.10, page 7, paragraph 2.2]

1.2 Use of IHO Cell Structure

ECDIS shall provide the capability to process and manage HO supplied ENC data in the following cell structure (TBR): [Derived, 2.2, page 14, paragraph 6.5]

Level:	Cell size:
World	8 degr x 8 degr
General	4 degr x 4 degr
Coastal	1 degr x 1 degr
Approach	30 min x 30 min
Harbour	15 min x 15 min
Plan	7.5 min x 7.5 min

(see note 212)

1.2.1 Use of IHO Cell Numbering System

ECDIS shall provide the capability to address, index, and manage ENC cells referenced via the IHO cell numbering system. [Derived, 2.2, page 14, paragraph 6.6]

1.2.2 Maintenance of IHO Cell Characteristics

If the IHO cell structure is modified internally, ECDIS shall maintain all cell dependent characteristics of the ENC data. [Derived, 2.2, page 12, paragraph 6.2.4]

1.3 ENC Coordinate System

ECDIS shall provide the capability to process positional data in the ENC stored in latitude and longitude coordinates.

1.4 ENC Horizontal Datum

ECDIS shall provide the capability to process ECDIS ENC data adjusted to the WGS-84 datum. [Derived, 2.2, page 5, paragraph 3.1]

August 1, 1991

ECDIS SRS/Version 2.2

1.5 ENC Vertical Datum

ECDIS shall provide the capability to process ECDIS ENC data adjusted to multiple vertical datums. [Derived, 2.2, page 5, paragraph 3.2]

1.6 (deleted)

1.6.1 (requirement combined with requirement 1.1.7)

1.6.2 (requirement moved to 1.1.9)

1.7 ENC Accuracy (moved from Part 5, Sec 3.1)

ECDIS shall be capable of meeting the accuracy requirements of the IHO with respect to ENC data. [2.1, page IV, paragraph 7.3]

2. GENERAL REQUIREMENTS FOR ECDIS UPDATING

2.1 Type of Updates

ECDIS shall be capable of processing updates for the ENC^s, as described in section 3, and for supplementary information related to the ENC^s. Supplementary information includes navigation publications, informational articles and general notices not related to a navigation document, as described in section 4.

2.2 Source of Updates

ECDIS shall be capable of accepting updates from three sources: global NTMs, local NTMs, and radio broadcasts.

2.3 Mode of Update

A portion of the global updates shall be performed automatically; however, the bulk of the updating process shall be interactive.

2.3.1 Automatic Update Processing

2.3.1.1 Format of NTM Correction Files

ECDIS shall be capable of reading digital NTM files in IHO DX-90 format and converting them to internal storage format. [2.1, page V, paragraph 11.2; Derived 2.10, page 9, paragraph 2.4.3]

2.3.1.1.1 Translation Verification

ECDIS shall provide the capability to translate the ENC update data to internal format, and then back to the HO format without any change in the resultant data. [Derived, 2.2, page 12, paragraph 6.2.5]

2.3.1.2 Integration of Digital Updates

ECDIS shall provide the capability to fully integrate corrections, provided in digital form, with the HO provided ENC data, while not overwriting the ENC data. The system shall use the master EC files and the master change files to produce a single file of chart data in internal format (System Electronic Navigation Chart) for each chart affected by the corrections. [2.10, page 10, paragraph 2.4.3; 2.1, page V, paragraph 11.2]

2.3.1.3 Automatic Application of Digital Updates

ECDIS shall provide the capability to integrate digital corrections with no operator intervention. [2.10, page 8, paragraph 2.4.1]

2.3.1.4 Application of Digital Updates to the SENC Display

ECDIS shall provide the capability to automatically process and apply ENC updates to the SENC displayed information. [2.1, page V, paragraph 11.2]

2.3.1.5 Timing of Automatic Updates

ECDIS shall provide the capability to perform automatic updates at the appropriate time and for the appropriate interval to provide an up-to-date SENC file to support the ECDIS display. [2.10, page 10, paragraph 2.4.3]

2.3.1.5.1 Default Time of Application for Automatic Updates

ECDIS shall by default implement an automatic update when received. [2.3, page 16, paragraph 7.7; 2.10, page 10, paragraph 2.4.3]

2.3.1.6 (deleted)

2.3.2 Interactive Update Processing

2.3.2.1 Application of Updates Interactively

ECDIS shall provide the capability to enter ENC updates interactively. [2.1, page V, paragraph 11.3; 2.3, page 11, paragraph 6.2.3.2]

2.3.2.2 Interactive Update Overlay

ECDIS shall provide the capability to overlay interactive corrections with ENC data to provide an up-to-date SENC ECDIS display. The overlay must be distinguishable from the original ENC data and the corrections entered automatically by electronic means. [2.4, page 28, paragraph 4.2.2; 2.10, page 10, paragraph 2.4.3; 2.10, page 8, paragraph 2.4.1]

2.3.2.2.1 (Combined with 2.3.2.2)

2.3.2.3 Verification of Interactive Updates

ECDIS shall provide the capability to verify interactively entered ENC updates prior to the final acceptance of the data. [2.1, page V, paragraph 11.3; 2.3, page 16, paragraph 7.11]

2.3.2.4 Interactive Update User Interface

ECDIS shall provide special features (TBR) to assist the mariner in ensuring that the data is entered correctly. [2.3, page 16, paragraph 7.11]

2.3.2.5 (moved to 3.8.6)

2.3.2.6 Storage of Interactive Updates

ECDIS shall provide the capability to store interactive updates separate from the integrated SENC containing automatic updates. [2.10, page 10, paragraph 2.4.3]

2.4 Update Distribution Media

ECDIS shall provide the capability to input, store, and process corrections received via the following communication media [Derived, 2.3, page 11, paragraph 6.2.7]:

2.4.1 HO Distribution Media

ECDIS shall provide the capability to receive and process protected HO-ENC updates from authorized chart agent or official agency received via 5 1/4" diskette.

(see note 3)

2.4.2 Hardcopy

ECDIS shall provide the capability to process HO-ENC corrections received on paper (e.g., Notice to Mariners)

2.4.3 Cassette or Diskette (requirement deleted because it was assumed that cassette will not be used; diskette is covered by requirement 2.4.1)

2.4.4 Telecommunications

ECDIS shall provide the capability to process HO-ENC corrections transmitted in an agreed IHO-format by any means of telecommunication (TBR).

(see note 5)

3. ELECTRONIC NAVIGATION CHART (ENC) UPDATE

3.1 ENC Update Categories

3.1.1 Standard Notice to Mariners (NTMs)

ECDIS shall provide the capability to process update information received as standard NTM chart corrections. [Derived, 2.10, page 8, paragraph 2.4.1]

3.1.2 Preliminary/Passive NTMs

ECDIS shall provide the capability to process update information consisting of changes known in advance (e.g. planned change of buoyage in an area) to be applied at a specified date in the future. These may be received in the form of preliminary NTM chart corrections or included in the original ENC (and thus the SENC) as "passive corrections." For an update which is to occur 'on or about' some time, the system shall prompt the mariner for instructions at that time. [Derived, 2.10, page 8, paragraph 2.4.1; 2.10, page 6, paragraph 1.4; 2.3, page 10, paragraph 5.10; 2.3, page 16, paragraph 7.7]

3.1.3 Temporary NTM's

ECDIS shall provide the capability to process update information received as temporary NTM chart corrections, consisting of corrections, such as adding or deleting certain features and/or attributes temporarily, which must be applied and subsequently removed at a specified date or at a date to be announced in the future. [Derived 2.2, page 16, paragraph 7.2; Derived, 2.10, page 8, paragraph 2.4.1; 2.10, page 6, paragraph 1.4]

3.1.4 Chartlets

ECDIS shall provide the capability to process update information received as graphic chart corrections, consisting of extensive graphic corrections which combine several changes into one recompiled file of correction data. [Derived, 2.10, page 8, paragraph 2.4.1; 2.10, page 6, paragraph 1.4]

3.2 ENC Update Types

3.2.1 Feature Updates

ECDIS shall provide the capability to process ENC updates that add, delete or replace certain point, line, area features, and/or attributes. [Derived, 2.2, page 16, paragraph 7.2]

3.2.1.1 Point Feature Updates

3.2.1.1.1 Add Point Feature

ECDIS shall provide the capability to add a point feature.

3.2.1.1.2 Delete Point Feature

ECDIS shall provide the capability to delete a point feature.

3.2.1.1.3 Replace Point Feature

ECDIS shall provide the capability to replace a point feature.

3.2.1.1.4 Modify Point Feature

ECDIS shall provide the capability to modify a point feature.

3.2.1.2 Line Feature Updates

3.2.1.2.1 Add Line Feature

ECDIS shall provide the capability to add a line feature.

3.2.1.2.2 Delete Line Feature

ECDIS shall provide the capability to delete a line feature.

3.2.1.2.3 Replace Line Feature

ECDIS shall provide the capability to replace a line feature.

3.2.1.2.4 Modify Line Feature

ECDIS shall provide the capability to modify a line feature.

3.2.1.3 Area Feature Updates

3.2.1.3.1 Add Area Feature

ECDIS shall provide the capability to add an area feature.

3.2.1.3.2 Delete Area Feature

ECDIS shall provide the capability to delete an area feature.

3.2.1.3.3 Replace Area Feature

ECDIS shall provide the capability to replace an area feature.

3.2.1.3.4 Modify Area Feature

ECDIS shall provide the capability to modify an area feature.

3.2.1.4 Attribute Data Updates

3.2.1.4.1 Point Feature Attributes

3.2.1.4.1.1 Add Point Feature Attributes

ECDIS shall provide the capability to add attributes for a point feature.

3.2.1.4.1.2 Delete Point Feature Attributes

ECDIS shall provide the capability to delete attributes for a point feature.

3.2.1.4.1.3 Replace Point Feature Attributes

ECDIS shall provide the capability to replace attributes for a point feature.

3.2.1.4.1.4 Modify Point Feature Attributes

ECDIS shall provide the capability to modify attributes for a point feature.

3.2.1.4.2 Line Feature Attributes

3.2.1.4.2.1 Add Line Feature Attributes

ECDIS shall provide the capability to add attributes for a line feature.

3.2.1.4.2.2 Delete Line Feature Attributes

ECDIS shall provide the capability to delete attributes for a line feature.

3.2.1.4.2.3 Replace Line Feature Attributes

ECDIS shall provide the capability to replace attributes for a line feature.

3.2.1.4.2.4 Modify Line Feature Attributes

ECDIS shall provide the capability to modify attributes for a line feature.

3.2.1.4.3 Area Feature Attributes

3.2.1.4.3.1 Add Area Feature Attributes

ECDIS shall provide the capability to add attributes for an area feature.

3.2.1.4.3.2 Delete Area Feature Attributes

ECDIS shall provide the capability to delete attributes for an area feature.

3.2.1.4.3.3 Replace Area Feature Attributes

ECDIS shall provide the capability to replace attributes for an area feature.

3.2.1.4.3.4 Modify Area Feature Attributes

ECDIS shall provide the capability to modify attributes for an area feature.

3.2.2 ENC Area Updates

ECDIS shall provide the capability to update ENC data consisting of a replacement or new edition of one or more ENC data cells. [Derived, 2.2, page 16, paragraph 7.2]

3.2.3 Temporary Updates (requirement combined with requirement 3.1.3)

3.3 Access to ENC Data for Update

ECDIS shall provide the capability to access the original ENC data at any time after the initial load and processing of the data to support ENC update. [Derived, 2.2, page 12, paragraph 6.2.5]

3.4 ENC Integrity Maintenance

3.4.1 Update Integrity Checking

ECDIS shall provide the capability to check the integrity of the ENC update data on receipt at the ECDIS for all data transfer methods. [2.3, page 14, paragraph 7.1; 2.3, page 14, paragraph 7.2]

3.4.2 Accuracy Preservation

3.4.2.1 Precision

ECDIS shall ensure that conversion of the HO provided corrections is performed with no loss of precision. [2.10, page 10, paragraph 2.4.3]

3.4.2.2 Information Content

ECDIS shall ensure that conversion of the HO provided corrections is performed with no loss of information content. [2.10, page 10, paragraph 2.4.3]

3.4.3 Conformance to Standards

ECDIS shall provide a capability to ensure that the resultant converted correction is certified to meet the same HO standards as the original files received. [2.10, page 10, paragraph 2.4.3]

3.4.4 ENC Security

ECDIS shall assure that HO supplied ENC data is safeguarded in its original form and protected from being overwritten (i.e., physically changed) by any ECDIS ENC update function or activity. [Derived 2.1, page V, paragraph 11.2; 2.3, page 4, paragraph 3.1; Derived, 2.2, page 11, paragraph 6.2.1; 2.2, page 16, paragraph 7.1]

3.5 Update Data Maintenance

3.5.1 Maintenance of ENC Change Data Sets

ECDIS shall maintain the ENC, the automatic update data and the interactive update data as separate data sets. [2.3, page 14, paragraph 7.1; Derived, 2.1, page V, paragraph 11.3; Derived, 2.1, page V, paragraph 11.2; 2.2, page 16, paragraph 7.1; 2.2, page 17, paragraph 7.4.1]

(see note 211)

3.5.2 Update Maintenance Life

ECDIS shall provide the capability to maintain NTM and interactive change data on board for the life of the EC edition or until a corrected copy issued by the HO is received. [2.10, page 11, paragraph 2.4.5]

3.6 Update Identification Checking

ECDIS shall provide the capability to check edition and identification numbers against the information already in the SENC and notify the user if they disagree. [2.3, page 14, paragraph 7.5]

3.7 Update Conversions, Adjustments, Translations

3.7.1 Update Conversions

3.7.1.1 Update Coordinate Conversion

ECDIS shall provide the capability to convert update positional data to latitude and longitude coordinates as described in section 13.

3.7.1.2 Update Unit Conversion

ECDIS shall provide the capability to convert update units to conform to IHO ECDIS standards as described in section 13.

3.7.1.3 (deleted due to duplication of requirement 3.7.3.2)

3.7.2 Update Adjustments

3.7.2.1 Update Horizontal Datum Adjustment

ECDIS shall provide the capability to adjust ENC update data to the WGS-84 datum as described in section 13. [Derived, 2.2, page 5, paragraph 3.1]

3.7.2.2 Update Horizontal Datum Adjustment Verification

ECDIS shall provide the capability to verify horizontal adjustment performed to convert update data to WGS-84. [Derived 2.2, page 12, paragraph 6.2.5]

3.7.2.3 (deleted due to statement of non-requirement)

3.7.3 Update Translation (deleted)

3.7.3.1 DX-90 Translation (requirement combined with requirement 2.3.1.1)

3.7.3.2 Translation Verification (requirement moved to 2.3.1.1.1)

3.8 Update Recording

3.8.1 Update Record File

ECDIS shall maintain a permanent update file to serve as a master data set of HO provided correction data. [2.10, page 9, paragraph 2.4.2]

3.8.2 Update Record Content

ECDIS shall record the following descriptive information regarding all updates applied to the ENC: [Derived 2.3, page 14, paragraph 7.4; 2.1, page V, paragraph 11.4; 2.2, page 17, paragraph 7.4.3; 2.3 page 16, paragraph 7.5]

- o Identification number
- o Past or future effective date/time
- o Actual implementation
- o Chart or cell number affected
- o Identification number of the previous update applicable to the chart or cell

3.8.3 Update Record Sorting

ECDIS shall provide the capability to sort update files by the following information: [2.3, page 14, paragraph 7.4]

- o Update number
- o Chart or cell number
- o Implementation date/time

3.8.4 Update Record Maintenance Life

ECDIS shall maintain update records for all updates applied since the last new edition of the ENC. [Derived 2.3, page 14, paragraph 7.4; 2.1, page V, paragraph 11.4, 2.2, page 17, paragraph 7.4.3]

3.8.5 (combined with 3.8.2)

3.8.6 Interactive Update Transaction Logging (moved from 2.3.2.5)

ECDIS shall include the capability to record the following descriptive information regarding interactive and automatic corrections to ENC data: [Derived, 2.3, page 16, paragraph 7.11]

- o Date/time change data was received
- o Date/time change was made
- o Source/Source ID of change
- o Name/ID of individual making change
- o Update mode (automatic, interactive)
- o Type of change (Add, Modify, Delete, Replace)
- o Name/ID of ENC cells updated
- o Effective date of change

3.9 Update Reporting

3.9.1 User Notification

ECDIS shall provide the capability to inform the user of all updates that have been applied to an ENC. [2.3, page 16, paragraph 7.7]

3.9.2 ENC Display Update Reports

ECDIS shall provide the capability to view ENC correction data files on the ECDIS Display screen as both textual and graphic information and include information on when the notice was applied and when it was removed if it has been subsequently superseded. [Derived, 2.10, page 11, paragraph 2.4.4]

3.9.3 Hardcopy Update Reports

ECDIS shall provide the capability to produce alphanumeric reports of updates to the ENC data using an on-line system printer and to include information on when the notice was applied and when it was removed if it has been subsequently superseded. [Derived, 2.1, page V, paragraph 11.4; Derived, 2.10, page 11, paragraph 2.4.5; Derived, 2.10, page 11, paragraph 2.4.4]

3.10 Affect of ENC Update on ECDIS Operations

ECDIS shall provide the capability for automatically updating the database without interfering with the display, except for an "updating-in-progress" note to be shown in distinctive lettering and colors in one corner of the active display. [2.3, page 14, paragraph 7.3; 2.18]

(see note 95)

3.11 ENC Update Volume (moved from Part 5, 4.1)

ECDIS shall support the receipt and processing of global HO corrections on the order of 300 kbytes per week. [2.17, page 15, paragraph 9.2.6]

3.12 Management of Amplifying Textual Notes

3.12.1 Amplifying Text Data Processing

ECDIS shall provide the capability to process, store, and link any amplifying textual notes included with NTM corrections to point features, area features, line features, text or tables. [Derived 2.10, page 11, paragraph 2.4.4]

3.12.2 Amplifying Text Data Loading

ECDIS shall provide the same capability to load NTM text data as described for other NTM data described in paragraph 1.1.

3.12.3 Amplifying Text Note Maintenance

ECDIS shall provide the capability to maintain and update amplifying text notes in the same manner as the NTM data to which they are linked.

3.12.4 Amplifying Text Note Recording

ECDIS shall provide the same recording capabilities for Amplifying Text Notes as are provided for the NTM data to which they are linked.

3.12.5 Amplifying Text Note Reporting

ECDIS shall provide the same reporting capabilities for Amplifying Text Notes as are provided for the NTM data to which they are linked.

3.13 Use of Paper Chart Update Information

ECDIS shall provide the capability to process update information that supports both paper chart and ECDIS users as described in the following paragraphs. [Derived, 2.10, page 6, paragraph 1.4]

3.13.1 Processing of Paper Chart NTM Data

3.13.1.1 Processing of Textual Paper Chart NTM Data

ECDIS shall provide the capability to store textual paper chart NTM information so that it may be recalled and viewed on a display screen. [Derived, 2.4, page 5, paragraph 1.2.3]

3.13.1.2 Processing of Graphic NTM Data

ECDIS shall provide the capability to store graphic (i.e. chartlet) paper chart NTM information so that it may be recalled and viewed on a display screen. [Derived, 2.4, page 5, paragraph 1.2.3]

3.13.2 Paper Chart NTM Data Loading

3.13.2.1 Load Textual and Graphic Paper Chart NTM Data in DX-90 Format

ECDIS shall provide the capability to load textual and graphic paper chart NTM Data in IHO DX-90 format. (TBR)

3.13.2.2 Load Textual Paper Chart NTM Data in ASCII Format

ECDIS shall provide the capability to load textual paper chart NTM Data in ASCII text format. (TBR)

3.13.3 Correlation of Paper Chart NTM Data to ENC Cells

ECDIS shall provide the capability to correlate paper chart NTM data to the appropriate ENC cells such that the user may identify and process all paper chart NTM related to a specific cell.

3.13.4 Printing of Textual Paper Chart NTM Data

ECDIS shall provide the capability to print out paper chart NTM information.

3.13.5 Maintenance Life of Paper Chart NTM Data

ECDIS shall provide the capability to maintain paper chart NTM Data on board for the life of the chart edition or until a correction is issued by the HO is received.

Note: Original Section 3. Management of Amplifying Textual Notes has been moved to new paragraph 3.12.

4. MANAGEMENT OF SUPPLEMENTARY DATA

ECDIS shall provide the capability to process supplementary information contained in the weekly global or local notices, such as corrections which apply to navigation publications, informational articles and general notices which do not pertain to any specific nautical document. [2.10, page 8, paragraph 2.4.1; 2.10, page 5, paragraph 1.2.3]

(see note 210)

4.1 General Notice Management

4.1.1 General Notice Processing

ECDIS shall provide the capability to process general notice data as described in the following paragraphs.

4.1.2 General Notice Loading

ECDIS shall provide the same capability to load General Notice Data as described for other NTM data described in paragraphs 2.3 and 2.4.

4.1.3 Linkage of General Notice Data

ECDIS shall provide the capability to link General Notice Data to ENC features or SENC symbols as appropriate for processing and display. [Derived, 2.4, page 23, paragraph 4.1.3 (b)]

4.1.4 Printing of General Notice Data

ECDIS shall provide the capability to print out general notice information. [2.10, page 8, paragraph 2.4.1]

4.1.5 Maintenance Life of General Notice Data

ECDIS shall provide the capability to store general notice information for the life of the ENC and charts maintained on board. (An average life-cycle of five years is assumed for sizing purposes) [Derived, 2.10, page 8, paragraph 2.4.1]

(see note 6)

4.2 Coast Pilot Data Management

4.2.1 Coast Pilot Data Processing

ECDIS shall provide the capability to store (textual and graphic feature data) Coast Pilot (Sailing Directions) information so that it may be recalled and viewed on a display screen. [2.10, page 5, paragraph 1.2.3]

4.2.2 Coast Pilot Data Loading

4.2.2.1 (deleted)

(see note 96)

4.2.2.2 Coast Pilot Data in ASCII Format

ECDIS shall provide the capability to load textual Coast Pilot Data in ASCII text format.

(see note 97)

4.2.3 Linkage of Coast Pilot Data

ECDIS shall provide the capability to link Coast Pilot Data to ENC features or SENC symbols as appropriate for processing and display. [Derived, 2.4, page 23, paragraph 4.1.3 (b)]

4.2.4 Printing of Coast Pilot Data

ECDIS shall provide the capability to print out Coast Pilot (Sailing Directions) textual information.

4.2.5 Maintenance Life of Coast Pilot Data

ECDIS shall provide the capability to store general Coast Pilot Data for (TBR) period of time.

(see note 7)

4.3 Light List Data Management

4.3.1 Processing of Light List Data

ECDIS shall provide the capability to store U.S Coast Guard Light List information so that it may be recalled and viewed on a display screen.[2.10, page 5, paragraph 1.2.3]

4.3.2 Light List Data Loading

4.3.2.1 Light List Data in DX-90 Format

ECDIS shall provide the capability to load Light List Data in IHO DX-90 format. (TBR)

4.3.2.2 Light List Data in ASCII Format

ECDIS shall provide the capability to load Light List Data in ASCII t format. (TBR)

4.3.3 Linkage of Light List Data

ECDIS shall provide the capability to link Light List information to ENC features or SENC symbols as appropriate for processing and display. [Derived, 2.4, page 23, paragraph 4.1.3 (b)]

4.3.4 Printing of Light List Data

ECDIS shall provide the capability to print Light List information.

4.3.5 Maintenance Life of Light List Data

ECDIS shall provide the capability to store Light List Data for (TBR) period of time.

4.4 (entire section moved to 3.13)

4.5 Ad-hoc User Data

ECDIS shall provide the capability for interactive ENC correction to allow the user to enter navigation warning and safety information, and local NTM not issued by a designated national chart correction authority. [2.10, page 8, paragraph 2.4.1]

4.5.1 Graphical Ad-Hoc User Data

ECDIS shall provide the capability to input user-defined symbols to represent local conditions, for which there are no international symbols as follows:

4.5.1.1 Add Point Data

ECDIS shall provide the capability to add point symbols.

4.5.1.2 Remove Point Data

ECDIS shall provide the capability to remove point symbols.

4.5.1.3 Modify Point Data

ECDIS shall provide the capability to modify point symbols.

4.5.1.4 Add Line Data

ECDIS shall provide the capability to add line symbols.

4.5.1.5 Remove Line Data

ECDIS shall provide the capability to remove line symbols.

4.5.1.6 Modify Line Data

ECDIS shall provide the capability to modify line symbols.

4.5.1.7 Add Area Data

ECDIS shall provide the capability to add area symbols.

4.5.1.8 Remove Area Data

ECDIS shall provide the capability to remove area symbols.

4.5.1.9 Modify Area Data

ECDIS shall provide the capability to modify area symbols.

4.5.2 Input Textual Ad-Hoc User Data

ECDIS shall provide the capability to input textual data to describe local conditions.

4.5.3 Linkage of Textual Ad-Hoc User Data

ECDIS shall provide the capability to link textual Ad-Hoc User Data to ENC features as appropriate for processing and display. [Derived, 2.4, page 23, paragraph 4.1.3 (b)]

4.5.4 Printing of Ad-Hoc User Data

ECDIS shall provide the capability to print Ad-Hoc User Data.

4.5.5 Maintenance Life of Ad-Hoc User Data

ECDIS shall provide the capability to store Ad-Hoc User Data for one year.

(see note 9)

4.6 Radio Navigational Aids Publication 117 Data Management

4.6.1 Processing of Radio Navigational Aids Publication 117 Data

ECDIS shall provide the capability to store Radio Navigational Aids Publication 117 information so that it may be recalled and viewed on a display screen.

4.6.2 Radio Navigational Aids Publication 117 Data Loading

4.6.2.1 Radio Navigational Aids Publication 117 Data in DX-90 Format

ECDIS shall provide the capability to load Radio Navigational Aids Publication 117 Data in IHO DX-90 format. (TBR)

4.6.2.2 Radio Navigational Aids Publication 117 Data in ASCII Format

ECDIS shall provide the capability to load Radio Navigational Aids Publication 117 Data in ASCII format. (TBR)

4.6.3 Linkage of Radio Navigational Aids Publication 117 Data

ECDIS shall provide the capability to link Radio Navigational Aids Publication 117 information to ENC features or SENC symbols as appropriate for processing and display.

4.6.4 Printing of Radio Navigational Aids Publication 117 Data

ECDIS shall provide the capability to print Radio Navigational Aids Publication 117 information.

4.6.5 Maintenance Life of Radio Navigational Aids Publication 117 Data

ECDIS shall provide the capability to store Radio Navigational Aids Publication 117 Data for (TBR) period of time.

4.7 Tidal Current Tables Data Management

4.7.1 Processing of Tidal Current Tables Data

ECDIS shall provide the capability to store Tidal Current Tables information so that it may be recalled and viewed on a display screen.

4.7.2 Tidal Current Tables Data Loading

4.7.2.1 Tidal Current Tables Data in DX-90 Format

ECDIS shall provide the capability to load Tidal Current Tables Data in IHO DX-90 format. (TBR)

4.7.2.2 Tidal Current Tables Data in ASCII Format

ECDIS shall provide the capability to load Tidal Current Tables Data in ASCII format. (TBR)

4.7.3 Linkage of Tidal Current Tables Data

ECDIS shall provide the capability to link Tidal Current Tables information to ENC features or SENC symbols as appropriate for processing and display.

4.7.4 Printing of Tidal Current Tables Data

ECDIS shall provide the capability to print Tidal Current Tables information.

4.7.5 Maintenance Life of Tidal Current Tables Data

ECDIS shall provide the capability to store Tidal Current Tables Data for (TBR) period of time.

4.8 Tidal Current Charts Data Management

4.8.1 Processing of Tidal Current Charts Data

ECDIS shall provide the capability to store Tidal Current Charts information so that it may be recalled and viewed on a display screen.

4.8.2 Tidal Current Charts Data Loading

4.8.2.1 Tidal Current Charts Data in DX-90 Format

ECDIS shall provide the capability to load Tidal Current Charts Data in IHO DX-90 format. (TBR)

4.8.2.2 Tidal Current Charts Data in ASCII Format

ECDIS shall provide the capability to load Tidal Current Charts Data in ASCII format. (TBR)

4.8.3 Linkage of Tidal Current Charts Data

ECDIS shall provide the capability to link Tidal Current Charts information to ENC features or SENC symbols as appropriate for processing and display.

4.8.4 Printing of Tidal Current Charts Data

ECDIS shall provide the capability to print Tidal Current Charts information.

4.8.5 Maintenance Life of Tidal Current Charts Data

ECDIS shall provide the capability to store Tidal Current Charts Data for (TBR) period of time.

4.9 Tidal Current Diagrams Data Management

4.9.1 Processing of Tidal Current Diagrams Data

ECDIS shall provide the capability to store Tidal Current Diagrams information so that it may be recalled and viewed on a display screen.

4.9.2 Tidal Current Diagrams Data Loading

4.9.2.1 Tidal Current Diagrams Data in DX-90 Format

ECDIS shall provide the capability to load Tidal Current Diagrams Data in IHO DX-90 format. (TBR)

4.9.2.2 Tidal Current Diagrams Data in ASCII Format

ECDIS shall provide the capability to load Tidal Current Diagrams Data in ASCII format. (TBR)

4.9.3 Linkage of Tidal Current Diagrams Data

ECDIS shall provide the capability to link Tidal Current Diagrams information to ENC features or SENC symbols as appropriate for processing and display.

4.9.4 Printing of Tidal Current Diagrams Data

ECDIS shall provide the capability to print Tidal Current Diagrams information.

4.9.5 Maintenance Life of Tidal Current Diagrams Data

ECDIS shall provide the capability to store Tidal Current Diagrams Data for (TBR) period of time.

4.10 Tide Tables Data Management

4.10.1 Processing of Tide Tables Data

ECDIS shall provide the capability to store Tide Tables information so that it may be recalled and viewed on a display screen.

4.10.2 Tide Tables Data Loading

4.10.2.1 Tide Tables Data in DX-90 Format

ECDIS shall provide the capability to load Tide Tables Data in IHO DX-90 format. (TBR)

4.10.2.2 Tide Tables Data in ASCII Format

ECDIS shall provide the capability to load Tide Tables Data in ASCII format. (TBR)

4.10.3 Linkage of Tide Tables Data

ECDIS shall provide the capability to link Tide Tables information to ENC features or SENC symbols as appropriate for processing and display.

4.10.4 Printing of Tide Tables Data

ECDIS shall provide the capability to print Tide Tables information.

4.10.5 Maintenance Life of Tide Tables Data

ECDIS shall provide the capability to store Tide Tables Data for (TBR) period of time.

4.11 Current Diagrams Data Management

4.11.1 Processing of Current Diagrams Data

ECDIS shall provide the capability to store Current Diagrams information so that it may be recalled and viewed on a display screen.

4.11.2 Current Diagrams Data Loading

4.11.2.1 Current Diagrams Data in DX-90 Format

ECDIS shall provide the capability to load Current Diagrams Data in IHO DX-90 format. (TBR)

4.11.2.2 Current Diagrams Data in ASCII Format

ECDIS shall provide the capability to load Current Diagrams Data in ASCII format. (TBR)

4.11.3 Linkage of Current Diagrams Data

ECDIS shall provide the capability to link Current Diagrams information to ENC features or SENC symbols as appropriate for processing and display.

4.11.4 Printing of Current Diagrams Data

ECDIS shall provide the capability to print Current Diagrams information.

4.11.5 Maintenance Life of Current Diagrams Data

ECDIS shall provide the capability to store Current Diagrams Data for (TBR) period of time.

5. UPDATES TO NAVIGATION PUBLICATIONS DATA

5.1 Navigation Publications Data Update Sources

ECDIS shall provide the capability to update Navigation Publications data from the same sources as updates are received for ENC data.

5.2 Use of Paper Chart Update Information

ECDIS shall provide the capability to process standard NTM, preliminary NTM, and temporary NTM information to update Coast Pilot, NTM, Radio Navigational Aids Publication 117, and Light List Data maintained within the system.

5.3 Navigation Publications Data Update Types

5.3.1 Navigation Publications Data Record Updates

ECDIS shall provide the capability to update NTM and the following list of publications by adding, deleting, or replacing existing data maintained within the system:

- o Coast Pilot
- o Radio Navigational Aids Publication 117
- o Light List
- o Tidal Current Tables
- o Tidal Current Charts
- o Tidal Current Diagrams
- o Tide Tables
- o Current Diagrams

5.3.2 Publication Updates

ECDIS shall provide the capability to update Navigation Publications Data records via load of a new edition/release of the following publications:

- o Coast Pilot
- o Radio Navigational Aids Publication 117
- o Light List
- o Tidal Current Tables
- o Tidal Current Charts
- o Tidal Current Diagrams
- o Tide Tables
- o Current Diagrams

5.4 Navigation Publications Data Update Distribution Media

ECDIS shall provide the capability to input, store, and process corrections for NTM data or any of the publications listed in paragraph 5.3.1, received via the following communication media: [Derived, 2.3, page 11, paragraph 6.2.7]

5.4.1 HO Distribution Media

ECDIS shall provide the capability to receive and process updates from an authorized chart agent or official agency received on official distribution media (TBR).

5.4.2 Hardcopy

ECDIS shall provide the capability to process corrections received on paper.

5.4.3 Cassette or Diskette

ECDIS shall provide the capability to process corrections received on diskette (TBR).

5.4.4 Telecommunications (TBR)

ECDIS shall provide the capability to process corrections transmitted in an agreed IHO-format by any means of telecommunication. (TBR)

5.5 Automatic Update Processing (TBR)

5.5.1 Automatic Processing of Navigation Publications Data (TBR)

ECDIS shall provide the capability to support the automatic processing and display of any navigation publications information available in a suitable digital form (TBR). [Derived, 2.10, page 12, paragraph 2.5.1]

5.5.2 Automatic Update Integration (TBR)

ECDIS shall provide the capability to integrate automatic updates or corrections for NTM data or any of the publications listed in paragraph 5.3.1, with on-board records to support the ECDIS display.

5.5.3 (deleted)

5.6 Interactive Update Processing

5.6.1 Application of Updates Interactively

ECDIS shall provide the capability to update data files for NTM data or any of the publications listed in paragraph 5.3.1, interactively via a keyboard.

5.6.2 Interactive Update Integration

ECDIS shall provide the capability to fully integrate interactive corrections with on-board files for NTM data or any of the publications listed in paragraph 5.3.1, to support the ECDIS display.

5.6.3 Verification of Interactive Updates of Navigation Publications Data

ECDIS shall provide the capability to verify interactively entered updates for NTM data or any of the publications listed in paragraph 5.3.1, prior to the final acceptance of the data.

5.6.4 User Interface for Navigation Publications Data Update

ECDIS shall provide special features (TBR) to assist the user in ensuring that the update data for NTM data or any of the publications listed in paragraph 5.3.1, is entered correctly. [Derived, 2.3, page 16, paragraph 7.11]

5.6.5 (moved to 5.11)

5.7 Update Data Maintenance

5.7.1 Maintenance of Navigation Publications Change Data Sets

ECDIS shall maintain automatic update data and interactive update data as separate data sets for NTM data or any of the publications listed in paragraph 5.3.1, respectively.

5.7.2 Update Maintenance Life for Navigation Publications Data

ECDIS shall provide the capability to maintain change data on board for the life of the navigation publication edition, for the life of the respective paper chart version for NTM data, or until a correction or corrected edition is issued by the HO. [Derived, 2.10, page 11, paragraph 2.4.5]

5.8 Navigation Publications Update Conversions, Adjustments, Translations

ECDIS shall provide capabilities to perform conversions, adjustments, and translations for Navigation Publications data as described in the following paragraphs.

5.8.1 Navigation Publications Update Conversions

ECDIS shall provide capabilities to perform unit conversions for navigation publications data as described in paragraph 13.6.

5.8.2 Navigation Publications Update Coordinate Transformations

ECDIS shall provide capabilities to perform coordinate transformations for navigation publications data as described in paragraph 13.7.

5.8.3 Navigation Publications Update Datum Transformations

ECDIS shall provide capabilities to perform datum transformations for navigation publication data as described in paragraph 13.7.

5.9 Navigation Publication Update Recording

5.9.1 Navigation Publication Update Record File

ECDIS shall maintain a permanent update file to serve as a master data set of all correction data applied to navigation publications data. [Derived, 2.10, page 9, paragraph 2.4.2]

5.9.2 Navigation Publications Update Record Content

ECDIS shall record the identification number, effective date/time, actual implementation date/time, and the publication, chart, or cell number affected for all updates applied to navigation publication data. [Derived, 2.3, page 14, paragraph 7.4; 2.1, page V, paragraph 11.4, 2.2, page 17, paragraph 7.4.3]

5.9.3 Non-ENC Update Record Sorting

ECDIS shall provide the capability to sort navigation publication update files by the following: [Derived, 2.3, page 14, paragraph 7.4]

- o Update number
- o Publication number/title
- o Chart or cell number
- o Implementation date/time

5.9.4 Update Record Maintenance Life

5.9.4.1 Light List Record Maintenance Life

ECDIS shall maintain records for all updates applied since the last new edition of the Light List and all on-board ENC cells to which it is correlated.

5.9.4.2 Coast Pilot Record Maintenance Life

ECDIS shall maintain records for all updates applied since the last new edition of the Coast Pilot and all on-board ENC cells to which it is correlated.

5.9.4.3 Paper Chart NTM Data Maintenance Life

ECDIS shall maintain records for all paper chart NTM updates received since the last new edition of the chart to which they apply and the last new edition of ENC to which the chart area is correlated.

5.9.4.4 General NTM Data Maintenance Life

ECDIS shall maintain records for all General Notice NTM updates until advised by the issuing authority that they are no longer valid.

5.9.4.5 Radio Navigational Aids Publication 117 Maintenance Life

ECDIS shall maintain records for all updates applied since the last new edition of the Radio Navigational Aids Publication 117 and all on-board ENC cells to which it is correlated.

5.9.4.6 Tidal Current Tables Record Maintenance Life

ECDIS shall maintain records for all updates applied since the last new edition of the Tidal Current Tables and all on-board ENC cells to which it is correlated.

5.9.4.7 Tidal Current Charts Record Maintenance Life

ECDIS shall maintain records for all updates applied since the last new edition of the Tidal Current Charts and all on-board ENC cells to which it is correlated.

5.9.4.8 Tidal Current Diagrams Record Maintenance Life

ECDIS shall maintain records for all updates applied since the last new edition of the Tidal Current Diagrams and all on-board ENC cells to which it is correlated.

5.9.4.9 Tide Tables Record Maintenance Life

ECDIS shall maintain records for all updates applied since the last new edition of the Tide Tables and all on-board ENC cells to which it is correlated.

5.9.4.10 Current Diagrams Record Maintenance Life

ECDIS shall maintain records for all updates applied since the last new edition of the Current Diagrams and all on-board ENC cells to which it is correlated.

5.10 Navigation Publications Data Update Reporting

ECDIS shall provide the same capability to report on the update of navigation publications data as for update data that is received for ENC data.

5.11 Navigation Publications Data Update Transaction Logging

ECDIS shall include the capability to record the following descriptive information regarding corrections to data for NTM data or any of the publications listed in paragraph 5.3.1:
[Derived, 2.3, page 16, paragraph 7.11]

- o Date/time change data was received
- o Date/time change was made
- o Source/Source ID of change

August 1, 1991

ECDIS SRS/Version 2.2

- o Name/ID of individual making change
- o Update mode (interactive, automatic)
- o Type of change (Add, Modify, Delete)
- o Name/ID of records/files/data elements updated
- o Effective date of change

5.12 Affect of Navigation Publication Update on ECDIS Operations

ECDIS shall provide the capability for updating of navigation publication data without interfering with the display . [Derived, 2.10, page 14, paragraph 7.3]

6. RADIO WARNING DATA MANAGEMENT

6.1 Radio Navigational Warnings

6.1.1 Radio Navigational Warning Processing

ECDIS shall provide the capability to process Radio Navigational Warnings for use when approaching their geographic area of application. [2.3, page 6, paragraph 4.2.2]

6.1.2 Linkage of Radio Navigational Warning Data

ECDIS shall provide the capability to link Radio Navigational Warnings Data to ENC features and/or SENC symbols as appropriate for processing and display. [Derived, 2.4, page 23, paragraph 4.1.3 (b)]

6.1.3 Radio Navigational Warnings Retention

ECDIS shall provide the capability to retain an individual Radio Navigational Warning message for up to 6 weeks. [2.3, page 6, paragraph 4.2.2]

6.2 NAVAREA Updates

6.2.1 NAVAREA Processing

ECDIS shall accept chart-relevant radio warnings from NAVAREA broadcasts for use in interactive updating of the ECDIS ENC. [Derived, 2.10, page 4, paragraph 3.6]

6.2.2 Linkage of NAVAREA Data

ECDIS shall provide the capability to link NAVAREA to ENC features and/or SENC symbols (TBR) as appropriate for processing and display. [Derived, 2.4, page 23, paragraph 4.1.3 (b)]

6.2.3 NAVAREA Update Retention

ECDIS shall provide the capability to retain an individual NAVAREA update message for up to (TBR).

6.3. NAVTEX Updates

6.3.1 NAVTEX Processing

ECDIS shall accept chart-relevant radio warnings from NAVTEX broadcasts for use in interactive updating of the ECDIS ENC. [Derived, 2.10, page 4, paragraph 3.6]

6.3.2 Linkage of NAVTEX Warning Data

ECDIS shall provide the capability to link NAVTEX to ENC features and/or SENC symbols as appropriate for processing and display. [Derived, 2.4, page 23, paragraph 4.1.3 (b)]

6.3.3 NAVTEX Update Retention

ECDIS shall provide the capability to retain an individual NAVTEX update message for up to (TBR).

7. SYSTEM ELECTRONIC NAVIGATION CHART (SENC) GENERATION

7.1 SENC Generation Frequency

ECDIS shall create the SENC from the ENC on as few occasions as possible. [2.3, page 14, paragraph 7.3]

7.2 Generation of SENC from multiple data sets

ECDIS shall provide the capability to generate SENC data sets from multiple independent ENC data sets of differing scales. [Derived, 2.2, page 5, paragraph 3.4]

7.3 SENC Projection

7.3.1 Mercator Projection

ECDIS shall provide the capability to project ENC data to the Mercator projection in generation of the SENC display. [Derived, 2.2, page 5, paragraph 3.3; 2.9, page 12, paragraph 4.2.5]

7.3.2 Secondary Projections

ECDIS shall provide the capability to project ENC data to the optional projections detailed in paragraph 13.7.3 to conform with paper chart specifications.

7.3.3 Default Projection Scale Parallel

ECDIS shall provide a default scale parallel during the projection process to ensure the SENC adheres to required accuracy specifications. [Derived, 2.2, page 5, paragraph 3.3]

7.3.4 Definition of Projection Scale Parallel

ECDIS shall provide the capability to interactively set the default scale parallel values used during the projection process.

7.3.5 Chart Projection to Support Radar

7.3.5.1 Default Projection for Radar Overlay

ECDIS shall ensure the default projection for radar overlay is Mercator.

7.3.5.2 Azimuthal Equidistant Projection

ECDIS shall provide the capability to support long range radar scales requiring the use of Azimuthal Equidistant projection. [2.9, page 12, paragraph 4.2.5]

7.3.5.2.1 Changing to Azimuthal Equidistant Projection

(TBR)

7.4 SENC Symbolization

7.4.1 Use of IHO Symbols and Colors

ECDIS shall utilize IHO approved symbols and colors to represent ENC information within the SENC display. [2.1, page IV, paragraph 6.1, 2.3, page 22, paragraph 4.1.2]

7.5 ENC Generalization

ECDIS shall not apply point reduction or data smoothing operations to ENC data. [Derived, 2.2, page 12, paragraph 6.2.3]

7.6 (deleted)

7.6.1 (moved to 2.5)

7.6.2 (moved to 2.5)

7.7 Generation of Derived Graphics

7.7.1 Generation of Scale Bar

ECDIS shall provide the capability to generate a scale bar showing 0.1; 0.5/ 1.0 nm etc. at the users option for display on large scale charts (1:79000 and larger). [Derived, 2.2, page 6, paragraph 3.4]

7.7.2 Generation of Latitude Bar

ECDIS shall provide the capability to generate a single or multiple latitude bars for display on the border of displays of small scale charts (1:80000 and smaller). [Derived, 2.2, page 6, paragraph 3.4]

7.7.3 Graticule Generation

ECDIS shall provide the capability to generate graticules for display on SENC displays. [Derived, 2.2, page 7, paragraph 4.1]

7.7.4 Grid Generation

ECDIS shall provide the capability to generate latitude and longitude grids for display on SENC displays.

(see note 19)

7.7.5 Magnetic Compass Rose Generation

August 1, 1991

ECDIS SRS/Version 2.2

ECDIS shall provide the capability to generate a Magnetic Compass Rose for display on SENC displays.

7.7.6 True Compass Rose Generation

ECDIS shall provide the capability to generate a True Compass Rose for display on SENC displays.

7.8 Adjustment of ENC Depth Data

ECDIS shall ensure that HO supplied depth data is not adjusted in any manner by the user or ECDIS processing. [Derived, 2.2, page 20, paragraph 8.3.8]

7.9 (moved to 13.11)

8. SYSTEM ELECTRONIC NAVIGATION CHART (SENC) DISPLAY

8.1 General Display Requirements

8.1.1 Display Components

ECDIS shall be capable of storing in memory and displaying, in multicolor, the following data: [Derived, 2.2, page 18, paragraph 8.1]

- o full set of symbols and abbreviations
- o ENC of the area of operations, simultaneously with any desired area for route planning
- o automatic and hand-entered ENC corrections
- o users additions to chart information

8.1.2 Feature Display

ECDIS shall provide the capability to distinguish clearly on the display among a very large number of features, using the following means: [2.4, page 7, paragraph 2.2.2]

- o colored areas, lines and symbols
- o coded lines (e.g. dashed) and areas (e.g. screened, patterned)
- o alphanumeric labels
- o varying the size of symbols or alphanumerics
- o cursor interrogation
- o switching a class of information on/off either automatically or by hand
- o splitting information into separate windows

8.1.3 Display of Data from Different Sources

ECDIS shall provide the capability to distinguish clearly on the display between a very large number of sources, for example, between information from the official ENC; hand-entered NTMs; local information; and navigator's notes, using these means: [2.4, page 7, paragraph 2.2.2]

- o colored areas, lines and symbols
- o coded lines (e.g. dashed) and areas (e.g. screened, patterned)
- o alphanumeric labels
- o varying the size of symbols or alphanumerics
- o cursor interrogation
- o switching a class of information on/off either automatically or by hand
- o splitting information into separate windows

8.1.4 Default SENC Display Scale

ECDIS shall ensure that the default SENC display scale is the scale at which the ENC data has been compiled by the HO (the scale at which the data is furnished). [2.2, page 6, paragraph 3.4]

(see note 142)

8.1.5 (deleted due to subjectivity)

8.1.6 Level of Chart Display Detail

ECDIS shall provide a level of chart detail based on the immediate purpose, generally simplified for route monitoring and more detailed for route planning. [2.4, page 22, paragraph 4.1.3 (a)]

8.1.7 Effective Size of SENC Chart Display (moved from part 5, 1.2)

ECDIS shall assure the effective size of the SENC chart presentation on the display device is at least 350mm X 270mm. [2.1, page IV, paragraph 10.2]

8.1.8 Display Visibility (moved from part 5, 1.3)

ECDIS shall assure that the method of ENC presentation within the SENC display is such that the displayed data are clearly visible to more than one observer in the conditions of light normally experienced on the bridge of a ship by day and by night. [2.1, page V, paragraph 10.4]

8.1.9 (deleted)

8.1.10 SENC Refresh Rate 2 (moved from part 5, 1.6)

Initial SENC display generation and complete redraw shall occur within 5 seconds. (In the event that the 5 seconds requirement cannot be met, image buffering shall be used in order to minimize "dead" unusable display time.) [2.2, page 7, paragraph 4.2]

8.1.11 Similarity of SENC Display to Paper Chart (moved from part 5, 1.8)

ECDIS display shall be similar to the paper chart wherever possible. [2.4, page 10, paragraph 2.2.8]

8.1.12 Primary, Secondary, and Auxiliary Displays

8.1.12.1 Primary Display (moved from part 5, 1.10.1)

ECDIS shall provide a primary graphic display for navigation and route monitoring. [Derived, 2.2, page 7, paragraph 4.2; 2.2, page 19, paragraph 8.3.2]

8.1.12.2 Secondary Display (moved from part 5, 1.10.2)

ECDIS shall provide a separate, secondary graphic display to be used for look ahead, route planning and graphic and alphanumeric information such as chart indices, source diagrams, light characters etc. [Derived, 2.2, page 7, paragraph 4.2; 2.2, page 19, paragraph 8.3.2]

8.1.12.3 Quality of Secondary Display (moved from part 5, 1.10.3)

The secondary ECDIS graphic display shall be of the same quality as the primary graphic display. [Derived, 2.2, page 7, paragraph 4.2]

August 1, 1991

ECDIS SRS/Version 2.2

8.1.12.4 Alphanumeric Display (moved from part 5, 1.10.4)

ECDIS shall provide an auxiliary screen for display of alphanumeric and nautical publications information, and also navigational information (time, ship's positions, etc.) and operator input text. [Derived, 2.2, page 19, paragraph 8.3; 2.15, paragraph 4.5]

8.1.12.4.1 Type Style

ECDIS shall use a plain, clearly visible script (e.g. Helvetica). Upper and lower case characters should be used to give contrast in a layout which should be carefully planned in accordance with ergonomic principles. [2.15, paragraph 4.5]

8.1.12.4.2 Alphanumeric Window on Graphic Display

For configurations where alphanumeric information is displayed as a block (or within a window) on the side of a graphics display, ECDIS shall provide the capability to display that block (or window) without distracting from viewing the graphics display. [2.15, paragraph 4.5]

8.1.12.4.3 Fonts (moved from 8.14.4)

ECDIS shall provide the capability to portray alphanumeric characters in the following fonts as specified in the Presentation Library (TBR). [2.4, page 33, paragraph 4.4.1]

(see note 27)

8.1.12.5 Primary and Secondary Display Capabilities (moved from part 5, 1.10.5)

ECDIS shall provide the capability to display official IHO-symbols, abbreviations and colors as specified for ECDIS on both the primary graphic display for actual navigation and optional additional graphic screen for "look ahead" passage/planning and supporting graphics for primary screen. [Derived, 2.2, page 19, paragraph 8.3.1; Derived, 2.2, page 19, paragraph 8.3.2]

8.1.12.6 Single Display Screen System Configuration (moved from part 5, sec 1.14)

ECDIS shall accommodate an alternate configuration of a system to perform both route planning and route monitoring on a single screen. [2.9, page 15, paragraph 4.2.14]

8.1.12.7 Display Interchangability (moved from part 5, 1.9)

ECDIS shall provide the capability to provide all route monitoring and route planning displays on either the primary or secondary graphic screen.

8.2 Display Content

8.2.1 ECDIS Default Display

When the system is first turned on, the default display shall be shown. The default display shall be divided such that a portion of the items are shown on the primary screen and the remaining, less important items, are shown on a secondary graphic or alphanumeric screen.

8.2.1.1 Default Display on the Primary Screen

The default display on the primary ECDIS screen shall consist of the following chart related features and navigation related items [2.2, page 19, paragraph 8.3.3; 2.1, page II, paragraph 3.2; 2.2, page 8, paragraph 5.2]:

- Canal
- Canal-bank
- Coastline
- Lake
- Lake-shore
- Land-area
- River
- River-bank
- Shoreline construction
- Intertidal area
- Zero-meter contour
- Isolated danger symbol
- Own ships safety depth contour *and depth label
- Depth area
- Simplified beacon symbol
- Simplified buoy symbol
- Cardinal buoy or beacon
- Fog signal
- Tower
- Fairway
- Dredged area
- Deep water route - part
- Deep water route - centerline
- Navigation Line
- *Ferry Route
- Precautionary area
- Recommended route-centerline
- Recommended track
- Recommended traffic lane part
- Submarine transit lane
- Traffic separation line
- Traffic separation scheme - boundary
- Traffic separation scheme - crossing
- Traffic separation scheme - lane part
- Traffic separation scheme - roundabout
- Traffic separation zone
- Traffic separation scheme - system (compound feature)
- Two-way route - part
- Radar reflector
- Any object with a CONRAD attribute value = 1 (radar conspicuous)
- Any object with a CONVIS attribute value = 1 (visual conspicuous)
- Anchorage area
- Cable area

August 1, 1991

ECDIS SRS/Version 2.2

- Cargo transshipment area
- Dumping ground
- Incineration area
- Military practice area
- Pipeline area
- Restricted area
- Seaplane landing area
- Spoil ground
- Indication of cautionary notes (any object with the INFORM attribute)
- Water turbulence
- Scale bar
- Chart scale boundaries
- Actual ship's position
- Warning that relation of geographic datum to WGS-84 is undetermined
- *Names and labels of prominent lights, points and landmarks
- *Range lines
- *Recreation areas
- *Tunnel crossings
- *Magnetic variation
- *All dangers
- *The navigator's info symbols
- *Ship's velocity vector
- *Ship's past track

* (see note 106)

(see Appendix E for mapping of IMO default display items to this list)

8.2.1.2 Default Display on the Secondary Screen

The default display on the secondary ECDIS screen shall consist of the following items [2.2, page 19, paragraph 8.3.3]:

- Unit of depth, height
- Text of caution notes
- Indicator that the vessel is in a restricted or prohibited area
- *Indicator that the vessel is off course by a preset tolerance

* (see note 106)

(see note 107)

(see Appendix E for mapping of IMO default display items to this list)

8.2.2 On-Demand Displays

ECDIS shall provide the capability for the operator to display on demand additional items on both the primary and secondary screens.

8.2.2.1 On-Demand Primary Display

The following chart related features and navigation related items may also be displayed on the primary screen, upon demand by the operator [2.1, page II, paragraph 3.3, Derived, 2.2, page 8, paragraph 5.2; 2.2, page 19, paragraph 8.3.3]:

Updates/Corrections to the features for safe navigation (Note: Terminology will be clarified)

Spot soundings

Details of isolated dangers

Details of aids to navigation

ENC edition date

Geodetic datum

Graticules

Symbol Library

Hand-entered "chartwork", notes, and corrections

(see note 108)

8.2.2.2 On-Demand Secondary Display

The following items may also be displayed on the secondary screen, upon demand by the operator [2.2, page 19, paragraph 8.3.4]:

Positional data and time

Legend

Attributes to features

Other textual information from HO-ENC

List of abbreviations

Results from navigational computations

Listing of ENC corrections

*Underwater cables and pipes

*Ship's velocity

*Tide and current information

* (see note 109)

8.2.3 Minimum Display Content

ECDIS shall "lock" the following display items so that they cannot be removed by the operator: (TBR)

(see note 141)

8.3 Default Display Access

8.3.1 Single Action Access of Default Display

ECDIS shall provide the capability for the operator to switch from any alternate display configuration to the default display using a single action. [2.1, page II, paragraph 3.2]

August 1, 1991

ECDIS SRS/Version 2.2

8.3.2 Continual Access of Default Display

ECDIS shall provide the capability for the operator to switch from any alternate display configuration to the default display at any time during ECDIS operations. [Derived, 2.1, page II, paragraph 3.2]

(see note 143)

8.4 Default Display Warning

ECDIS shall automatically provide a continuous and visible warning when any of the default EC display items are absent. [Derived, 2.1, page III, paragraph 3.4]

8.5 Display Priorities

8.5.1 Priority 1 Display Data

ECDIS shall display ECDIS-warnings/messages (e.g. caution, over-and underscale) as priority 1 data. [Derived, 2.2, page 15, paragraph 6.8]

8.5.2 Priority 2 Display Data

ECDIS shall display HO-supplied point and linear data and automatic Notice to Mariner (NTM) ENC updates as priority 2 data. [Derived, 2.2, page 15, paragraph 6.8]

8.5.3 Priority 3 Display Data

ECDIS shall display interactively entered NTM data and interactive user input as priority 3 data. [Derived, 2.2, page 15, paragraph 6.8]

8.5.4 Priority 4 Display Data

ECDIS shall display HO-supplied caution data (ENC cautions) as priority 4 data. [Derived, 2.2, page 15, paragraph 6.8]

8.5.5 Priority 5 Display Data

ECDIS shall display HO-supplied color-fill data as priority 5 data. [Derived, 2.2, page 15, paragraph 6.8]

8.5.6 Priority 6 Display Data

ECDIS shall display HO-supplied on-demand display data as priority 6 data. [Derived, 2.2, page 15, paragraph 6.8]

8.5.7 Priority 7 Display Data

ECDIS shall display radar information as priority 7 data. [Derived, 2.2, page 15, paragraph 6.8]

8.5.8 Priority 8 Display Data

ECDIS shall display user-input point and line data as priority 8 data. [Derived, 2.2, page 15, paragraph 6.8]

8.5.9 Priority 9 Display Data

ECDIS shall display manufacturer point and line data as priority 9 data. [Derived, 2.2, page 15, paragraph 6.8]

8.5.10 Priority 10 Display Data

ECDIS shall display user-input area data as priority 10 data. [Derived, 2.2, page 15, paragraph 6.8]

8.5.11 Priority 11 Display Data

ECDIS shall display manufacturer area data as priority 11 data. [Derived, 2.2, page 15, paragraph 6.8]

8.5.12 Default Display Priority Data

ECDIS shall provide Priority 1 through Priority 5 data as a part of the default ECDIS display. [Derived, 2.2, page 15, paragraph 6.8]

8.5.13 Relationship of Priority Data

ECDIS shall display ENC data such that higher priority data is not obscured by lower priority data (priority 1 being the highest and priority 11 the lowest). The higher priority data is always clearly distinguished from all other data on the ECDIS display. [Derived, 2.1, page III, paragraph 3.7, Derived, 2.2, page 15, paragraph 6.8]

8.5.14 Priority of non-HO Information Display

ECDIS shall ensure that non-HO information will not obscure ENC chart information. [2.4, page 11, paragraph 2.3.1]

8.5.15 Priority of Information Relative to Ship's Position

The ECDIS relative display should be positioned to maximize look-ahead capability, such that more information ahead of the ship along the planned route is shown than information behind her. [2.4, page 11, paragraph 2.3.1]

8.5.16 Danger Area Display Priority

ECDIS shall provide the capability for SENC information to be readable through the danger warning. [2.4, page 18, paragraph 3.2.3]

8.5.17 Area Feature Display Priority

ECDIS shall provide the capability to display point symbols, line symbols, and text as top priority, unobscured by area features. [2.4, page A4, paragraph A3.2.4]

8.6 Display Units

8.6.1 (deleted due to subjectivity)

8.6.2 Position Display Units

The display units for position on ECDIS SENC displays shall be latitude and longitude in degrees, minutes and decimal minutes. [2.2, page 6, paragraph 3.5]

8.6.3 Default Depth Display Units

The display units for depth data on ECDIS SENC displays shall be in meters and decimeters. [2.2, page 6, paragraph 3.5]

8.6.4 Auxiliary Depth Display Units

ECDIS shall provide the capability to display sounding data in fathoms and feet in areas where existing chart data is held in those units only. [2.2, page 6, paragraph 3.5]

8.6.5 Height Display Units

The display units for height on ECDIS SENC displays shall be either meters or feet. [2.2, page 6, paragraph 3.5]

8.6.6 Distance Display Units

The display units for distance on ECDIS SENC displays shall be either nautical miles and decimal miles, or meters. [2.2, page 6, paragraph 3.5]

(see note 110)

8.6.7 Speed Display Units

The display units for speed on ECDIS SENC displays shall be knots and decimal knots. [2.2, page 6, paragraph 3.5]

8.7 Display Orientation

8.7.1 North-up Display of ENC Data

ECDIS shall provide the capability to display ENC data in a north-up SENC display. [2.1, page IV, paragraph 9.1]

8.7.2 Default Orientation

ECDIS shall ensure the normal default display orientation of the SENC display is north-up. [2.4, page 23, paragraph 4.1.4]

8.7.3 Course-up Display Orientation

ECDIS shall provide the capability for a course-up oriented SENC display. [2.4, page 23, paragraph 4.1.4]

8.7.4 Generation of Course-up Display

ECDIS shall generate the course-up display by rotating the ENC, as one piece, together with a clearly indicated North arrow. [Derived, 2.2, page 7, paragraph 4.1]

8.7.5 Course-up Display Alteration

ECDIS shall provide the capability to alter a course-up SENC display at infrequent intervals in order to avoid jitter from frequent rewriting of chart information as described in the following paragraphs: [2.4, page 23, paragraph 4.1.4]

8.7.5.1 Interactive Course-up Display Alteration

ECDIS shall provide the capability to alter a course-up display at user command.

8.7.5.2 Automatic Course-up Display Alteration

ECDIS shall provide the capability to alter a course-up SENC display automatically at a default alteration of ship's course from the displayed course orientation for a default period of time.

8.7.5.2.1 Automatic Course Alteration Defaults

The default course alteration and time for automatic update of an ECDIS course-up SENC display shall be twenty (20) degrees for a period of (TBR) minutes. [Derived, 2.4, page 23, paragraph 4.1.4]

(see note 196)

8.7.5.2.2 User Definition of Course Alteration Defaults

ECDIS shall provide the capability for user definition and update of the default course-up SENC-display update course alteration and time values.

8.7.5.2.3 Display of Course Alteration Defaults

ECDIS shall provide the capability to display default course-up SENC-display update course alteration and time values at user command.

8.7.6 Indication of North Direction on Course-Up Display

August 1, 1991

ECDIS SRS/Version 2.2

Page 53

ECDIS shall automatically indicate the North direction on SENC displays in any orientation other than "north-up." [2.1, page IV, paragraph 9.1]

8.7.7 Orientation of Symbols on Course-up Display

In instances when SENC data is displayed "course-up" all SENC symbols and alphanumerics shall remain North oriented. [Derived, 2.2, page 7, paragraph 4.1; 2.4, page 24, paragraph 4.1.4]

8.7.8 (deleted due to duplication by 8.7.5)

8.8 Use of Alphabets and Languages

8.8.1 Display Language

English shall be used as the international language within ECDIS displays. [Derived, 2.2, page 15, paragraph 6.9]

8.8.2 Geographic Names Display Language

ECDIS shall provide the capability to utilize non-English alphabets (TBR) to display geographical names within displays.

8.9 Display Legend

8.9.1 General Requirements

ECDIS shall provide the capability to display on the primary or secondary display, on demand, a legend of general information applicable to the ship's position. This legend shall contain, at minimum: [Derived, 2.2, page 6, paragraph 3.6]

- o Units for depth
- o Units for height
- o Scale of display
- o Quality indicator
- o Sounding datum
- o Horizontal datum
- o The value of the safety contour (if used)
- o Magnetic variation
- o Date and number of last update affecting the chart cell currently in use
- o date of issue of the ENC

(see note 207)

8.9.2 Legend Depth Display

ECDIS shall provide the capability to continuously display a legend containing the units for depth on the primary display. [Derived, 2.2, page 6, paragraph 3.6]

8.10 Display of Multiple Scale Areas

ECDIS shall provide the capability to have available simultaneously different scale charts containing the vessel, but only one chart of one scale is on view at one time. The default scale for any display is the largest scale chart containing the position of own-ship. [Derived, 2.1, page III, paragraph 4.3; 2.18]

(see note 164)

8.11 EC Feature Attribute Display

ECDIS shall provide the capability to display all available attributes for a feature identified with a cursor on the graphic display. [Derived, 2.2, page 9, paragraph 5.3]

8.12 (deleted due to duplication by previous requirements)

8.12.1 Feature-Related Text Display

ECDIS shall provide the capability to display related textual information for feature identified with a cursor on the graphic display. [Derived, 2.2, page 9, paragraph 5.4]

8.13 Display of Lines and Symbols

8.13.1 General Requirements

ECDIS shall portray all lines, symbols and alphanumerics as specified in the ECDIS Presentation Library computer file, including color tables, the ECDIS version of chart INT 1, new chart symbols for ECDIS, navigation symbols, ARPA symbols, area identification patterns, line thickness and coding, and fonts for alphanumerics. [2.4, page 21, paragraph 4.1.1]

8.13.1.1 (moved to 2.6.2.1)

8.13.1.1 Symbol Angularity (moved from part 5, 1.13.1)

ECDIS shall ensure that, at a minimum, symbols and characters subtend 20 arc minutes at the observer's eye (for example, a symbol viewed from 70cm should be at least 4mm, about 1.5 times the size of a normal chart symbol).

8.13.1.2 Angular Error of Line Symbols (moved from part 5, 1.13.2)

ECDIS shall assure that lines used for the purpose of navigation should be displayed with an angular error not greater than plus or minus 0.50 degrees. [2.1, page IV, paragraph 7.1]

8.13.1.3 Complex Symbol Size (moved from part 5, 1.13.3)

ECDIS shall ensure that, at a minimum, complex symbols and alphanumerics are approximately 50% larger than simple symbols.

8.13.1.4 Simple Symbol Size (moved from part 5, 1.13.4)

August 1, 1991

ECDIS SRS/Version 2.2

Simple symbols used in the SENC display, but not specified in the ECDIS Presentation Library, shall span approximately 12 pixels in extent (equivalent to 4mm on an IHO standard screen). [2.3, page 22, paragraph 4.1.2]

8.13.1.5 Line Thickness Determination (moved from part 5, 1.13.5)

ECDIS shall utilize a pixel size of 0.3 mm for computing line thicknesses. [2.4, page 21, paragraph 4.1.1]

8.13.1.6 Viewing Distance (moved from part 5, 1.12)

8.13.1.6.1 Operational Viewing Distance for Route Planning (moved from part 5, 1.12.1)

ECDIS shall provide the capability to easily interpret lines and symbols at the operational viewing distance of 70 cm for route planning. [2.4, page 7, paragraph 2.2.1; 2.4, page 21, paragraph 4.1.1]

(see note 1)

8.13.1.6.2 Operational Viewing Distance for Route Monitoring (moved from part 5, 1.12.2)

ECDIS shall provide the capability to easily interpret lines and symbols at the operational viewing distance of 70 cm for route monitoring. [2.4, page 7, paragraph 2.2]

(see note 1)

8.13.1.6.3 Operational Viewing Distance for Text

ECDIS shall provide the capability to display text such that the characters are clearly visible from the viewing distance required by the operator (which will have to be determined by experience). [2.15, paragraph 4.5]

8.13.2 Symbol Types

ECDIS shall include the capability to display and manipulate chart symbols which have been introduced for ECDIS. [2.4, page 24, paragraph 4.2.1]

8.13.2.1 Simplified Generic Symbols

ECDIS shall include the capability to display and manipulate simplified generic symbols for buoys, beacons, isolated dangers, and radar conspicuous coastline, providing an alternative to a variety of complicated symbols.

8.13.2.1.1 Simplified Buoy and Beacon Symbols

8.13.2.1.1.1 Simplified Beacon Symbol

ECDIS shall provide the capability to portray a simplified beacon symbol which represents any structure on land or on the seabed that is useful for navigation. This includes navigation beacons, lighthouses, offshore installations and conspicuous landmarks. The center of the symbol shall mark the position of the beacon. Colors should be used as for buoys. [2.4, page 25, paragraph 4.2.2]

8.13.2.1.1.2 Simplified Buoy Symbols (Non-cardinal)

ECDIS shall provide the capability to portray all non-cardinal buoys by a circle, black or colored with the dominant color of the buoy, with an open center marking the position. A black outline should be shown by day. In the case of multi-colored buoys, isolated danger buoys should be shown black, safe water buoys white, and special buoys yellow. The topmark is not shown. [2.4, page 25, paragraph 4.2.2]

8.13.2.1.1.3 Simplified Buoy and Beacon Symbols (Cardinal)

ECDIS shall provide the capability to portray all cardinal buoys and beacons by the cardinal topmark only. [2.4, page 25, paragraph 4.2.2]

8.13.2.1.1.4 Display of Buoys

ECDIS shall provide the capability to show buoys and their light flares in yellow, red or green, according to the color of the buoys, lights and light sectors, with a black outline by day. [2.4, page 32, paragraph 4.3.2; 2.4, page 19, paragraph 3.2.3]

8.13.2.1.1.5 Description of Buoys and Beacons Command

ECDIS shall provide the capability to portray descriptions of buoys and beacons by a simple "buoys and beacons" command requiring minimal operator action. [2.4, page 31, paragraph 4.3.2]

8.13.2.1.1.6 Display of Buoy and Beacon Characteristics (Option 1)

ECDIS shall provide the capability to show buoy and beacon characteristics by simplified symbols alone. [2.4, page 31, paragraph 4.3.2]

8.13.2.1.1.7 Display of Buoy and Beacon Characteristics (Option 2)

ECDIS shall provide the capability to show buoy and beacon characteristics by simplified symbols plus light flare. [2.4, page 31, paragraph 4.3.2]

8.13.2.1.1.8 Display of Buoy and Beacon Characteristics (Option 3)

ECDIS shall provide the capability to show buoy and beacon characteristics by simplified symbols plus light characteristics, racon and fog signal characteristics if any. [2.4, page 31, paragraph 4.3.2]

8.13.2.1.1.9 Display of Buoy and Beacon Characteristics (Option 4)

ECDIS shall provide the capability to show buoy and beacon characteristics by full-chart symbols alone. [2.4, page 31, paragraph 4.3.2]

8.13.2.1.1.10 Display of Buoy and Beacon Characteristics (Option 5)

ECDIS shall provide the capability to show buoy and beacon characteristics by full chart symbols plus buoy color, pattern and name/number, and racon/fog signal characteristics if any. [2.4, page 31, paragraph 4.3.2]

8.13.2.1.1.11 Display of Buoy and Beacon Characteristics (Option 6)

ECDIS shall provide the capability to show buoy and beacon characteristics by full chart symbols plus light flare. [2.4, page 31, paragraph 4.3.2]

8.13.2.1.1.12 Display of Buoy and Beacon Characteristics (Option 7)

ECDIS shall provide the capability to show buoy and beacon characteristics by full chart symbols plus light characteristics and fog signal if any. [2.4, page 31, paragraph 4.3.2]

8.13.2.1.1.13 Display of Buoy and Beacon Characteristics (Option 8)

ECDIS shall provide the capability to show buoy and beacon characteristics by full chart symbols plus all information on the paper chart. [2.4, page 32, paragraph 4.3.2]

8.13.2.1.1.14 Display of All Buoy and Beacon Characteristics

ECDIS shall provide the capability for the "buoys and beacons" command to act on all buoys and beacons shown on the display. [2.4, page 32, paragraph 4.3.2]

8.13.2.1.1.15 Display of Individual Buoy and Beacon Characteristics

ECDIS shall provide the capability for the "buoys and beacons" command to show details of a specific buoy or beacon identified by cursor. [2.4, page 32, paragraph 4.3.2]

8.13.2.1.2 Display of Lights

ECDIS shall provide the capability to portray lights as part of the standard display by night only. By day, they should not be shown for route monitoring (unless of high intensity for daylight viewing), since they would cause unnecessary clutter. [2.4, page 31, paragraph 4.3.2]

8.13.2.1.2.1 Automatic Addition of Light Flares

ECDIS shall provide the capability to add the light flares automatically as part of daytime to dusk dimming. [2.4, page 31, paragraph 4.3.2]

8.13.2.1.2.2 Interactive Addition of Light Flares

ECDIS shall provide the capability to portray light flares, not automatically, but available by simple command. [2.4, page 25, paragraph 4.2.2]

8.13.2.1.2.3 Display of Light Flares and Characteristics

ECDIS shall provide the capability to add/remove light flares alone, or add/remove light flares with characteristics including any fog signals by a single command. [2.4, page 31, paragraph 4.3.2]

8.13.2.1.2.3.1 Information on Individual Lights

ECDIS shall provide the capability to display information on an individual light by cursor interrogation. [2.4, page 31, paragraph 4.3.2]

8.13.2.1.2.4 Display of Light Sectors (Option 1)

ECDIS shall provide the capability to indicate light sectors in the navigation channel by colored bands along the edge of the sector rather than by arcs. [2.4, page 31, paragraph 4.3.2]

8.13.2.1.2.5 Display of Light Sectors (Option 2)

ECDIS shall provide the capability to indicate light sectors in the navigation channel by a small scale light-sector diagram showing in outline the area covered by the main display. [2.4, page A12, paragraph A4.3.2]

8.13.2.1.2.5.1 Location of Display of Light Sectors (Option 2)

ECDIS shall provide the capability to display a small scale light sector diagram on a separate screen or windowed on the main display. [2.4, page A12, paragraph A4.3.2]

8.13.2.1.2.6 Display of Light Sectors (Option 3)

ECDIS shall provide the capability to indicate light sectors in the navigation channel by automatic detection of ship's position within the sector, generating written information on the sectors and azimuth of the light. [2.4, page A12, paragraph A4.3.2]

8.13.2.1.2.7 Display of Light Sectors (Option 4)

ECDIS shall provide the capability to indicate light sectors in the navigation channel by a "transparent" area shade, plus an arrow pointing towards the light or patterned shade, with pattern indicating direction of light. [2.4, page A12, paragraph A4.3.2]

8.13.2.1.3 Isolated Underwater Danger

ECDIS shall provide the capability to portray a general symbol for isolated underwater danger. This applies to rocks, wrecks, small shoals, etc., of depth less than the own-ship safety contour which lie outside that safety contour. The surrounding circle is a diagrammatic safety contour. [2.4, page 27, paragraph 4.2.2]

8.13.2.1.4 Dredged Channel

ECDIS shall provide the capability to portray a dredged-channel symbol, with limits emphasized by a heavy dashed line, which may contain the dredged depth, or may be interrogated by cursor to read out the dredged depth. [2.4, page 30, paragraph 4.3.2, page 27, paragraph 4.2.2]

8.13.2.1.5 Coastline

ECDIS shall provide the capability to portray coastline which is radar conspicuous. This includes cliffs and steep coastlines that can be expected to return a strong radar echo consistently from the same part of the feature. [2.4, page 27, paragraph 4.2.2]

8.13.2.2 New ECDIS Symbols

ECDIS shall include the capability to display the symbols, described in the following paragraphs, as indicated in table 3 in the proposed IHO color and symbol specification. [2.4, page 26]

8.13.2.2.1 Indication of Caution Symbol

ECDIS shall provide the capability to portray an indication of caution symbol. It should be able to be interrogated with the cursor to print out the caution in a separate alphanumeric part of the display. [2.4, page 27, paragraph 4.2.2]

8.13.2.2.2 Information Available Symbol

ECDIS shall provide the capability to portray an information available symbol intended as a cursor look-up point either for chart information or navigator's notes. [2.4, page 27, paragraph 4.2.2]

8.13.2.2.3 Scale Boundary

ECDIS shall provide the capability to portray a scale boundary to show where the scale of the chart data available changes. A single line shall be on the small scale side of the boundary and a double line on the large scale side. [2.4, page 27, paragraph 4.2.2]

8.13.2.2.4 Overscale

ECDIS shall provide the capability to portray an overscale part of display, in grey screen. This is required to alert the navigator to chart information enlarged from a smaller scale. [2.4, page 27, paragraph 4.2.2; 2.4, page 18, paragraph 3.2.3]

8.13.2.2.5 North Arrow

ECDIS shall provide the capability to portray a north arrow. [2.4, page 27, paragraph 4.2.2]

8.13.2.2.6 Ramark, Racon

ECDIS shall provide the capability to portray a ramark or racon. This is introduced to distinguish beacons that will appear on the radar display from other radio beacons. [2.4, page 28, paragraph 4.2.2]

8.13.2.2.7 Chart Cursor

ECDIS shall provide the capability to portray a full-screen chart cursor to provide a line ruler, and to aid the operator in searching for the cursor. [2.4, page 28, paragraph 4.2.2]

8.13.2.3 Symbols Used for Navigational Routines

ECDIS shall include the capability to display and manipulate the following symbols used for navigational routines: [2.1, page VII, Appendix 2; 2.16, page 6, paragraph 5]

- o Own ship
- o Past track
- o Vector for heading and speed
- o Vector for course and speed made good
- o Range rings
- o Electronic dividers
- o Parallel indexing lines
- o Cursor mark
- o Waypoint
- o Event
- o Dead reckoning position (DR)
- o Estimate position (EP)
- o Position probability area (PPA)
- o Fix
 - o visual
 - o astronomical
 - o radar
 - o electronic position-fixing system (EFPS)
- o Position lines
- o Transferred position lines
- o Planning track
- o Current vector
- o Dangers
- o Clearing lines
- o Distance to run
- o Planned position and time
- o Visual limits of lights
- o Position for "wheel over"
- o Navigator's general notes
- o Manual chart correction

8.13.2.3.1 Specifications for Navigation Lines and Symbols

ECDIS shall include the capability to display and manipulate navigation lines and symbols developed by CIRM according to table 3 in the proposed IHO color and symbol specification. [2.4, page 24, paragraph 4.2.1; 2.4, page 26]

8.13.2.4 ARPA symbols

ECDIS shall include the capability to display the following ARPA symbols according to Table 3 in the proposed IHO color and symbol specifications : [2.4, page 24, paragraph 4.2.1]

- o Target Identifier
- o Target Group Identifier
- o Target Range
- o Target Bearing
- o Target Course
- o Target Speed
- o Target Predicted Closest Point of Approach
- o Time to Target Predicted Closest Point of Approach
- o Potential Collision Points
- o Danger/Threat Targets
- o Lost Targets
- o Time and Date
- o Others (TBR)

(see note 197)

8.13.2.5 ECDIS INT1 Symbols

ECDIS shall provide the capability to portray ECDIS INT1 chart symbols, based on existing INT1 symbols with minor modifications, as detailed in the following sections. [2.4, page 28, paragraph 4.3.2]

8.13.2.5.1 Use of IHO INT1 Section IA (Chart number, Title, Marginal Notes)

ECDIS shall provide the capability to display the information contained in section IA of INT1 such that the information currently listed in the IHO INT1 will be included in the legend. Detailed information available on chart accuracy should be included. [2.4, page 28, paragraph 4.3.2]

(see note 114)

8.13.2.5.2 (deleted due to duplication by requirement 14.3.1.1)

8.13.2.5.3 Tides and Currents

8.13.2.5.3.1 Tidal Level Diagram

ECDIS shall provide the capability to display the information contained in section IH of INT1 such that tidal definitions, and especially the diagram defining water levels and charted elevations with respect to chart datum, should be available to the mariner for reference in the ECDIS symbol library. [2.4, page 29, paragraph 4.3.2]

8.13.2.5.3.2 Tidal Stream Symbol and Table

ECDIS shall provide the capability to use the tidal stream symbol with the cursor to write the tidal stream table on an alphanumeric display. [2.4, page 29, paragraph 4.3.2]

8.13.2.5.3.3 Display of Tidal Information

ECDIS shall provide the capability to display official tidal information (tabled, transmitted, or computed) on the secondary graphic screen or alphanumeric display.

(see note 205)

8.13.2.5.3.4 Display of Current Information

ECDIS shall provide the capability to display ebb and flow current arrows with a numeric indication in knots of the existing current (TBR).

(see note 120)

8.13.2.5.4 (moved to 8.13.2.5.3.2)

8.13.2.5.5 Depth Shading for Route Planning

ECDIS shall provide the capability to portray four depth shades for route planning: [2.4, page 29, paragraph 4.3.2]

- o 1. 0 to 2 m
- o 2. 2 m to the own-ship safety contour
- o 3. own-ship safety contour to 30 m
- o 4. deeper than 30 m

8.13.2.5.5.1 Depth Shades for Route Monitoring

ECDIS shall provide the capability to portray only two depth shades for route monitoring: deeper than the own-ship safety contour or shallower than the safety contour. [2.4, page 30, paragraph 4.3.2]

8.13.2.5.6 Contours and Soundings

ECDIS shall provide the capability to portray any contour or sounding in the HO-ENC on the display. [2.4, page 30, paragraph 4.3.2]

August 1, 1991

ECDIS SRS/Version 2.2

8.13.2.5.7 Use of IHO Section IJ (Nature of the Seabed)

ECDIS shall provide the capability to display the information contained in section IJ of INT1 such that these abbreviations and a simplified version of the symbols are available (TBR). [2.4, page 30, paragraph 4.3.2]

(see note 138)

8.13.2.5.8 Rocks, Wrecks, Obstructions

ECDIS shall include all symbols contained in section IK (Rocks, Wrecks, Obstructions) of INT1 in the ECDIS Presentation Library and have them available for route planning, along with diagrams explaining their meaning. [2.4, page 30, paragraph 4.3.2]

8.13.2.5.9 Offshore Installations

ECDIS shall have all symbols contained in section IL (Offshore Installations) of INT1 available for route planning. [2.4, page 30, paragraph 4.3.2]

8.13.2.5.10 Use of IHO Section IM (Tracks, Routes)

ECDIS shall utilize the paper chart INT 1 national symbols, contained in section IM of INT1, for recommended fairway and recommended route, together with the international radio reporting point and all traffic routing symbols. [2.4, page 30, paragraph 4.3.2]

8.13.2.5.10.1 Traffic Separation Zones

ECDIS shall provide the capability to generate chart area shades to distinguish traffic separation zones in magenta screen. [2.4, page 18, paragraph 3.2.3]

8.13.2.5.11 Leading Lines

ECDIS shall provide the capability to portray leading lines by a special symbol, with cursor query point, since the marks defining them will often be off-screen. [2.4, page 30, paragraph 4.3.2]

8.13.2.5.12 Fog Signals

ECDIS shall provide the capability to always portray the "fog signal" symbol and to include the type of signal in the light and buoy information. The type of signal should also be available by cursor interrogation. [2.4, page 32, paragraph 4.3.2]

8.13.2.5.13 Radar and Radio Stations

ECDIS shall distinguish radar and radio stations by a magenta circle with details provided by a simple command or cursor interrogation. [2.4, page 32, paragraph 4.3.2]

8.13.2.5.14 Display of Electronic Positioning System Lattices

ECDIS shall display electronic positioning system lattices as an option. These should be an exact representation of the calibrated lattices shown on the chart. If this is not the case, a prominent warning must be shown, and details provided of how the lattice lines were prepared. [2.4, page 32, paragraph 4.3.2]

8.13.2.5.15 Pilot Services

ECDIS shall provide the capability to display details of pilot service by cursor interrogation. [2.4, page 32, paragraph 4.3.2]

8.13.2.5.16 Small Craft Facilities

ECDIS shall provide the capability to portray small craft facilities using the yacht symbol, coupled with cursor interrogation. [2.4, page 32, paragraph 4.3.2]

8.13.3 (deleted due to subjectivity)

8.13.4 Symbol and Character Size at Specified Scales

ECDIS shall assure that the same size of symbols, figures, and letters are used for all specified scales of EC display. [2.1, page III, paragraph 4.2]

8.13.5 Feature Labels

ECDIS shall provide the capability to generate and display feature labels on demand on EC displays. [Derived, 2.2, page 7, paragraph 4.1]

8.13.6 Feature Deletion Symbolology

8.13.6.1 Point Feature Deletion Symbolology

ECDIS shall provide the capability to symbolize a point feature deletion by placing a colored slash symbol through the particular feature. [Derived, 2.2, page 17, paragraph 7.4.1]

8.13.6.2 Line Feature Deletion Symbolology

ECDIS shall provide the capability to symbolize a line feature deletion by (TBR).

(see note 25)

8.13.6.3 Area Feature Deletion Symbolology

ECDIS shall provide the capability to symbolize a area feature deletion by (TBR).

(see note 26)

8.13.7 Feature Addition Symbolology

August 1, 1991

ECDIS SRS/Version 2.2

8.13.7.1 Point Feature Addition Symbology

ECDIS shall provide the capability to symbolize an ECDIS point feature addition by symbolizing that particular point feature using the same symbol in the default display but in a different color. [Derived, 2.2, page 17, paragraph 7.4.1]

8.13.7.2 Line Feature Addition Symbology

ECDIS shall provide the capability to symbolize an ECDIS line feature addition by symbolizing that particular line feature using the same symbol in the default display but in a different color. [Derived, 2.2, page 17, paragraph 7.4.1]

8.13.7.3 Area Feature Addition Symbology

ECDIS shall provide the capability to symbolize an ECDIS area feature addition by symbolizing that particular area feature using the same symbol in the default display but in a different color. [Derived, 2.2, page 17, paragraph 7.4.1]

8.14 Display Portrayal

8.14.1 (deleted due to duplication)

8.14.2 (deleted due to duplication)

8.14.3 Alphanumeric Characters

ECDIS shall provide the capability to portray alphanumeric characters in black and always upright. [2.4, page 33, paragraph 4.4.1; 2.4, page 19, paragraph 3.2.3; 2.4, page 21, paragraph 4.1.1]

8.14.4 (moved to 8.1.12.4.3)

8.14.5 Own-Ship Contour Display

ECDIS shall provide the capability to portray own-ship safety contour in cyan (blue-green) as a double thickness line, different from any other line on the chart display, and reinforced by a sharp change in depth shade. [2.4, page 19, paragraph 3.2.3]

8.14.6 (deleted due to duplication by requirement 8.13.2.1.1.4)

8.14.7 Own-Ship and Associated Symbols

ECDIS shall provide the capability to portray own-ship symbol, heading and speed vector (water track), and past track, as heavy black symbols and black lines on the light background of the day-time chart display; white symbols and white lines on the dark background of the night-time chart display. [2.4, page 19, paragraph 3.2.3]

(see note 145)

8.14.7.1 Hull-Shaped Ship Symbol

ECDIS shall provide the capability to portray a hull-shaped or arrowhead ship symbol, to give an immediate sense of direction. [2.4, page 19, paragraph 3.2.3]

(see note 146)

8.14.7.2 Scale of Ship Symbol

ECDIS shall provide the capability to portray the ship to scale.

8.14.7.3 Past Track Data

ECDIS shall provide the capability to portray events, position fixes, etc. associated with the past track, the same color as the past track.: black by day, white by night. [2.4, page 20, paragraph 3.2.3]

8.14.7.4 Course and Speed Vectors

ECDIS shall provide the capability to portray own-ship course and speed-made-good vectors: dashed black line/white line at night, to contrast with the continuous black/white line of the ship's head. [2.4, page 20, paragraph 3.2.3]

8.14.8 (renumbered)

8.14.9 (renumbered)

8.14.10 (renumbered)

8.14.11 Navigator's Chartwork

8.14.11.1 Planned Route and Associated Notations

ECDIS shall provide the capability to portray planned route and associated navigation planning notations in red. [2.4, page 20, paragraph 3.2.3]

8.14.11.2 Miscellaneous Navigator's Chartwork and Notations

ECDIS shall provide the capability to portray all navigator's chartwork, except the planned route, and associated notations in dark orange-red. This includes the following: [2.4, page 20, paragraph 3.2.3]

- variable range markers

August 1, 1991

ECDIS SRS/Version 2.2

- electronic bearing lines
- wheel-over notations
- the navigator's information symbol
- hand-entered chart corrections

8.14.12 (replaced by 8.14.11.2)

8.14.13 (replaced by 8.14.11.2)

8.14.14 (replaced by 8.14.11.2)

8.14.15 Radar Information

8.14.15.1 ARPA

ECDIS shall provide the capability to portray radar target information and information transferred from ARPA in green. [2.4, page 20, paragraph 3.2.3]

(see note 147)

8.14.15.2 Radar Video (moved from 8.15.6.1)

ECDIS shall provide the capability to generate non-chart area shades for radar video images in green. [2.4, page 18, paragraph 3.2.3]

8.14.16 Manufacturer's Information

(see note 152)

8.14.16.1 Manufacturer's Information - Points & Lines

ECDIS shall provide the capability to portray lines and symbols representing information from manufacturers, port authorities, etc. in yellow or blue in a manner which will not obscure or be confused with H.O. chart information. [2.4, page 21, paragraph 3.2.3]

8.14.16.2 Manufacturer's Information - Areas (moved from 8.15.6.4)

ECDIS shall provide the capability to generate non-chart area transparent shades for mariners, manufacturers, port authorities, etc. in orange, green, yellow, and grey. [2.4, page 18, paragraph 3.2.3]

8.15 Application of Shades and Patterns

8.15.1 General Requirement for Shading

ECDIS shall provide the capability to apply transparent area overlays in such a way that the details of the lines and symbols, and the outlines of all area features, remain clearly distinguishable. [2.4, page A3, paragraph A3.2.4]

8.15.2 General Requirement for Patterning

ECDIS shall provide the capability to apply transparent area patterns in such a way that the details of the lines and symbols, and the outlines of all area features, remain clearly distinguishable.

8.15.3 (deleted)

8.15.4 (deleted)

8.15.5 (deleted)

8.15.5.1 (deleted due to duplication by requirement 8.13.2.5.5)

8.15.5.2 (deleted due to duplication by requirement 8.13.2.5.5)

8.15.5.3 (moved to requirement 8.13.2.5.10.1)

8.15.5.4 (requirement combined with requirement 8.13.2.2.4)

8.15.5.5 (moved to 8.15.6.2)

8.15.6 (deleted)

8.15.6.1 (moved to 8.14.15.2)

8.15.6.2 Danger Areas

ECDIS shall provide the capability for the navigator to apply a red area shade to indicate a danger that affects own ship. [2.4, page 18, paragraph 3.2.3; 2.4, page 11, paragraph 2.2.9]

8.15.6.3 (deleted due to duplication by previous requirements)

8.15.6.4 (moved to 8.14.16.2)

8.15.7 General Use Shading

ECDIS shall provide, for general use, any type of shading to represent area features, as long as the shades used have no possibility of masking or causing confusion with chart information. [2.4, page 18, paragraph 3.2.3]

8.15.8 General Use Patterning

ECDIS shall provide the capability to apply user-defined patterns for representing area features, as long as the patterns used have no possibility of masking or causing confusion with chart information. [2.4, page 18, paragraph 3.2.3]

8.15.9 (deleted)

8.16 Display of Derived Graphics

8.16.1 Display of Scale Bar

ECDIS shall provide the capability to display a scale bar showing 0.1; 0.5/ 1.0 nm etc. at the users option when navigating on large scale charts (1:79000 and larger). [Derived, 2.2, page 6, paragraph 3.4]

8.16.2 Display of Latitude Bar

ECDIS shall provide the capability to display a latitude bar on the border of SENC displays of small scale charts (1:80000 and smaller) at the user's option. [Derived, 2.2, page 6, paragraph 3.4]

8.16.3 Graticule Display

ECDIS shall provide the capability to display graticules on demand on SENC displays. [Derived, 2.2, page 7, paragraph 4.1]

8.16.4 Grid Display

ECDIS shall provide the capability to display latitude and longitude grids on demand on SENC displays.

(see note 28)

8.16.5 Magnetic Compass Rose Display

ECDIS shall provide the capability to display a Magnetic Compass Rose on demand on SENC displays.

8.16.6 True Compass Rose Display

ECDIS shall provide the capability to display a True Compass Rose on demand on SENC displays.

8.17 SENC Update Display

8.17.1 Display of Updates

ECDIS shall display the updated chart without the appearance of previous stages of the chart. [2.3, page 8, paragraph 5.9]

8.17.2 Integrated Display

ECDIS shall display integrated ENC files and NTM correction data in accordance with IHO ECDIS display specifications. [Derived, 2.10, page 10, paragraph 2.4.4]

8.17.3 ENC Update Differentiation

ECDIS shall provide the capability to distinguish and display ENC updates on the SENC display for verification and to ascertain the changes which have been made. [Derived, 2.1, page V, paragraph 11.4]

8.17.4 ENC Update Identification

ECDIS shall assure that interactive ENC updates are distinguishable on the SENC display from HO-supplied ENC data at the interactive request of the user. [2.1, page V, paragraph 11.3]

8.17.5 ENC Update Priority

ECDIS shall assure that display of interactive ENC updates does not affect the SENC display legibility of ENC. [2.1, page V, paragraph 11.3]

8.17.5.1 Priority of Interactively Entered Updates

ECDIS shall control the display of interactively entered corrections, such that these never replace the ENC data on the display. [2.3, page 16, paragraph 7.9, Derived, 2.2, page 17, paragraph 7.4.1]

(see note 208)

8.17.6 Display of Insertion and Deletion Updates

ECDIS shall provide the capability to display SENC deletion and insertion updates simultaneously. [2.3, page 16, paragraph 7.8]

8.17.7 Highlighting of SENC Updates

ECDIS shall provide the capability for the user to select individual updates and have them highlighted on the SENC display, by the use of different colors and/or intensities. [2.3, page 16, paragraph 7.8]

8.17.7.1 Persistence of Updated Features Highlights

ECDIS shall provide the capability to leave particular updates (both interactive and automatic) highlighted during normal operation of the ECDIS. [2.3, page 16, paragraph 7.8]

8.17.8 Display of Interactive Change Data Sets

ECDIS shall provide the capability to separately store interactively entered update information and display it on demand as an overlay to the SENC. [2.10, page 10, paragraph 2.4.3]

8.17.9 Display of Amplifying Text

ECDIS shall provide the capability to display amplifying textual notes included with the NTM corrections on demand. [2.10, page 11, paragraph 2.4.4]

8.17.10 Identification of Amplifying Text Notes in Display

ECDIS shall assure that a displayed update data draws attention to any amplifying textual notes included with the NTM corrections. [2.10, page 11, paragraph 2.4.4]

8.17.11 Display of Notice Duration

ECDIS shall provide the capability for the user to display the time of application and the duration of preliminary and temporary notices, as well as the length of time the change was, or will be, in effect. [2.10, page 11, paragraph 2.4.4]

8.18 Display of Warnings, Alerts, and Notices

8.18.1 Navigation Hazard Alerts and Warnings

Under certain conditions ECDIS shall inform the user of specific dangers or faults and changes in operation that could affect the safety of navigation. The following conditions, at a minimum, shall cause an audio alarm to sound and/or a descriptive warning message to be displayed on the primary display: [Derived, 2.2, page 20, paragraph 8.3.5]

- o Overscale or overscale in percentage (see note 209)
- o Own ship has entered a restricted zone (see note 117)
- o Depth unit change
- o When relation to WGS-84 is undetermined
- o Display less than default scale
- o *Ship crosses own ship safety contour
- o Significant deterioration in positioning (see note 192)

* (see note 106)

8.18.2 Persistence of Navigation Hazard Warnings

ECDIS shall provide the capability to temporarily silence an audio alarm associated with a warning, but the warning message will remain on the primary graphic display as long as the condition that caused it exists. [Derived, 2.2, page 20, paragraph 8.3.5]

8.18.3 Display Scale Alert

ECDIS shall provide a warning(s) if SENC data are displayed at scales (underscale or overscale) other than the specified scale of the ENC from which it was generated. [2.1, page III, paragraph 4.1]

8.18.4 Larger Scale Available Alert

ECDIS shall provide a descriptive alert message to be displayed on the primary SENC display when a larger scale SENC is available for display by the user. [Derived, 2.2, page 20, paragraph 8.3.5].

8.18.5 Persistence of SENC Scale Alerts

ECDIS shall provide the capability to remove SENC Scale Alerts at the users option. [Derived, 2.2, page 20, paragraph 8.3.5]

8.18.6 Scale Boundary Demarcation Line Alert

ECDIS shall ensure that if SENC data of different scales appear on the display, a scale-boundary demarcation line is clearly indicated. [Derived, 2.2, page 5, paragraph 3.4; 2.4, page 24, paragraph 4.1.5]

8.18.7 Persistence of Scale Boundary Demarcation Line

ECDIS shall assure the Scale Boundary Demarcation Line remains on the primary graphic display as long as the condition exists.

8.18.8 ENC Horizontal Datum Warning

ECDIS shall provide the capability to display a prominent warning on the graphic display when the geographic relationship of ENC data-to-WGS-84 datum cannot be determined, or there is a legal requirement to use a different datum. A signal (flag) will be present in the ENC indicating use of this warning. [Derived, 2.2, page 5, paragraph 3.1; 2.18]

(see note 118)

8.18.9 Persistence of Horizontal Datum Warning

ECDIS shall assure the horizontal datum warning message remains on the primary graphic display as long as the condition exists.

8.18.10 ENC Vertical Datum Notice

ECDIS shall provide the capability to determine when the SENC data displayed is derived from ENC data based on different vertical datums. A note indicating such will be shown within the display. [Derived, 2.2, page 5, paragraph 3.3]

8.18.11 Persistence of Vertical Datum Notice

ECDIS shall assure the vertical datum notification message remains on the primary graphic display as long as the condition exists.

8.18.12 Chart Reliability Notice

ECDIS shall have available, where the information is available in the ENC, an indication of chart reliability, which can be shown on demand. [2.4, page 24, paragraph 4.1.6]

8.18.13 (deleted due to duplication by 8.18.12)

8.18.14 Ship Off-Track Warning

ECDIS shall provide a warning if the ship is off-track by a default distance of (TBR).

(see note 170)

8.18.15 Persistence of Ship Off-Track Warning

ECDIS shall assure the Ship Off-Track Warning remains on the primary graphic display as long as the condition exists.

8.18.16 Detection of Abnormal or Hazardous Conditions

ECDIS shall detect abnormal or hazardous conditions along the route of the ship, that would normally be considered to be a warning on a printed chart (TBR). [2.9, page 13, paragraph 4.2.7]

(see note 45)

8.18.16.1 Abnormal or Hazardous Condition Warnings and Alarms

ECDIS shall provide audible and visual alarms/warnings of any condition normally considered to be a warning on a printed chart. [2.9, page 13, paragraph 4.2.7]

8.18.16.2 Persistence of Abnormal or Hazardous Condition Warnings and Alarms

ECDIS shall assure Abnormal or Hazardous Condition alarms/warning shall remain active and on display until the ship has passed entirely through the area for which the condition was indicated.

8.19 (moved to 8.13.2.5.3.3)

August 1, 1991

ECDIS SRS/Version 2.2

Page 74

8.20 (deleted)

8.20.1 (moved to 9.7)

8.20.2 (moved to 8.15.5.5)

8.21 (moved to 8.13.2.5.3.4)

August 1, 1991

ECDIS SRS/Version 2.2

Page 75

9. SYSTEM ELECTRONIC NAVIGATION CHART (SENC) MANIPULATION

9.1 Removal of Items from Display

ECDIS shall provide the capability to remove any items of ENC content from the display. [Derived, 2.1, page III, paragraph 3.4]

(see note 121)

9.1.1. Operator Control of Display Item Removal

ECDIS shall assure that the addition or subtraction of display information is possible with a minimum of operator controls and actions. [2.1, page III, paragraph 3.5]

9.2 Display Type Manipulations

9.2.1 Relative Motion Display

ECDIS shall provide the capability to display ENC data in a "relative motion" SENC display. [Derived, 2.1, page IV, paragraph 9.2]

9.2.2 True Motion Display

ECDIS shall, by default, display ENC data in a "true motion" SENC display. [2.1, page IV, paragraph 9.2]

9.2.2.1 Reset of True Motion Display

When "true motion" SENC display mode is activated, ECDIS shall provide the capability to automatically reset and generate the SENC display for the neighboring area when the ship crosses into an invisible, virtual margin along the edge of the display. The margin shall be defined as the space from 25% of the distance from outer limit to center, to the outer limit. [2.1, page IV, paragraph 9.2; 2.18]

(see note 29)

9.2.3 Indication of Display Mode

ECDIS shall automatically and continuously display, within the SENC display, a positive indication of the display mode in use. [2.1, page IV, paragraph 9.3]

9.2.4 Change of Display Type

ECDIS shall provide the capability to reset and generate an alternate (either relative or true motion) SENC display type for current chart area in use.

9.3 Interactive Change of Chart Area

ECDIS shall provide the capability to change the chart area on the SENC display interactively. [2.1, page IV, paragraph 9.4]

9.4 (deleted due to duplication by requirement 11.6.2)

9.5 Display Zoom

9.5.1 Increase Display Magnification

9.5.1.1 Discrete Magnification

ECDIS shall provide the capability to increase the magnification of the Display image a maximum value of 25% of the compilation scale. [2.18]

(see note 30)

9.5.1.2 Continuous Increase in Magnification

ECDIS shall provide the capability to increase the magnification within the 25% discrete range to exactly specify a desired scale. [2.18]

9.5.2 Decrease Display Magnification

9.5.2.1 Discrete Magnification

ECDIS shall provide the capability to decrease the magnification of the Display image a maximum value of 25% of the compilation scale. [2.18]

(see note 31)

9.5.2.2 Continuous Decrease in Magnification

ECDIS shall provide the capability to decrease the magnification within the 25% discrete range to exactly specify a desired scale. [2.18]

9.5.3 Symbol Size During Zoom

ECDIS shall provide the capability for symbol size to remain constant when the display is zoomed to a scale different from the compilation scale of the chart data displayed. [2.4, page 22, paragraph 4.1.2; 2.2, page 10, paragraph 5.5]

9.6 Generation of Alternate Displays

ECDIS shall provide the capability to switch to a negative image of the chart at night, using a dark background in place of the white background of the paper chart and lines which are black on a light background by day to be switched to white (light grey) on a dark background at night. This dimming shall consist of four stages: daylight, twilight, dusk, and night. [2.4, page 19, paragraph 3.2.3; 2.4, page 10, paragraph 2.2.8]

9.6.1 Daylight Display

ECDIS shall provide the capability to produce daylight displays utilizing color table 1a in the proposed IHO color and symbols specification. [Derived 2.4, page 13, paragraph 3.1.2]

9.6.2 Twilight Display

ECDIS shall provide the capability to produce twilight displays utilizing color table 1b in the proposed IHO color and symbols specification. [Derived 2.4, page 13, paragraph 3.1.2]

9.6.3 Dusk Display

ECDIS shall provide the capability to produce dusk displays utilizing color table 2a in the proposed IHO color and symbols specification. [Derived 2.4, page 13, paragraph 3.1.2]

9.6.4 Night Display

ECDIS shall provide the capability to produce night displays utilizing color table 2b in the proposed IHO color and symbols specification. [Derived 2.4, page 13, paragraph 3.1.2]

9.6.5 (moved to 9.6)

9.6.5 Alphanumeric Display Dimming

ECDIS shall provide the capability for the alphanumeric display to follow the same dimming procedures as for the graphics display, using black characters on a white/grey background by day and white characters on a black background at night, with two dimming stages for each. [2.15, paragraph 4.5]

9.6.5.1 (combined with requirement 9.6.5)

9.6.6 Use of Software Dimming

ECDIS shall provide no dimming other than the "software dimming" specified in the IHO display table specification. [2.4, page 13, paragraph 3.1.2]

9.6.7 Display Adjustment Operator Controls

ECDIS shall assure that display adjustment for light conditions may be performed, interactively, with a minimum of operator controls and actions.

9.7 Placement of Flashing Symbols (moved from 8.20.1)

ECDIS shall reserve flashing a feature for attention-getting, as described in the following paragraphs. [2.4, page 11, paragraph 2.2.9]

9.7.1 Non-Chart Warnings Symbol

ECDIS shall provide the capability to annotate the display, by use of a flashing symbol in the area of the potential hazard, in the case of warnings referring to non-chart information or very temporary conditions. [2.3, page 17, paragraph 7.13; Derived, 2.2, page 10, paragraph 5.5]

9.7.2 Preliminary Notice-to-Mariner Warning Symbol

ECDIS shall provide the capability to annotate the display, by use of a flashing symbol in the area of the potential hazard, in the case of Preliminary Notice-to-Mariner information. [2.3, page 17, paragraph 7.13; Derived, 2.2, page 10, paragraph 5.5]

9.7.3 Temporary Notice-to-Mariner Warning Symbol

ECDIS shall provide the capability to annotate the display, by use of a flashing symbol in the area of the potential hazard, in the case of Temporary Notice-to-Mariner information. [2.3, page 17, paragraph 7.13; Derived, 2.2, page 10, paragraph 5.5]

9.7.4 Potential Hazard Description Symbol

ECDIS shall provide the capability to associate a flashing symbol in the area of a potential hazard with text entry to be called up on command by the mariner and superimposed on the chart. [2.3, page 17, paragraph 7.13; Derived, 2.2, page 10, paragraph 5.5]

9.8 Placement of Dangers Symbol

ECDIS shall provide the capability for the Dangers symbol to be applied to features selected by the navigator. [2.4, page 18, paragraph 3.2.3]

NOTE: Sections 10 and 11 have been switched to reflect the operational sequence of these activities.

10. ROUTE PLANNING

10.1 General Requirement

ECDIS shall provide the capability to carry out route planning independently of route monitoring in a simple and reliable manner. [2.1, page III, paragraph 5.1]

10.2 SENC Selection for Route Planning

ECDIS shall provide the capability to pre-select SENC databases encompassing a geographic area to support route planning.

10.2.1 Select by User Identification

10.2.1.1 Input of Cell Number

ECDIS shall provide the capability to select specific SENC databases by interactively specifying the cell number in accordance with standards established by the IHO.

10.2.1.2 Selection from Available Databases

ECDIS shall provide the capability to select specific SENC databases by interactively selecting them from a list of available databases.

10.2.1.3 Select by Chart Number

ECDIS shall provide the capability to select all SENC databases corresponding to a specific navigational chart area by interactively specifying the chart number.

10.2.1.4 Select by Rectangular Geographic Area

ECDIS shall provide the capability to select all SENC databases within a specified geographic area by interactively entering two diagonally opposed points.

10.2.1.4.1 Select by Rectangular Geographic Area and Scale

ECDIS shall provide the capability to select SENC databases of a specified scale within a specified geographic area by interactively entering two diagonally opposed points.

10.2.1.5 Select by Geographic Area Polygon

ECDIS shall provide the capability to select all SENC databases within a specified geographic area by interactively entering a polygon consisting of up to 99 sides.

10.2.1.5.1 Select by Geographic Area Polygon and Scale

ECDIS shall provide the capability to select SENC databases of a specified scale within a specified geographic area interactively entered by the user as a polygon consisting of up to 99 sides.

10.2.1.6 Select from Stored Area Boundary

ECDIS shall provide the capability to select specific SENC databases by interactively selecting them from a list of stored area polygons.

10.2.2 Selection by Index Map

ECDIS shall provide the capability to select SENC database data by interactively selecting the outline of the database from an index map as described in paragraph 14.1.7. [2.4, page 24, paragraph 4.1.5]

10.3 Plan Chart Content and Configuration

ECDIS shall provide the capability to plan the SENC content and configuration of the route monitoring display at the same time as the route is planned and then to "save" that display layout and have it reproduced automatically when the ship reaches the area. [2.4, page 9, paragraph 2.2.6]

10.3.1 SENC Content Display During Route Planning

ECDIS shall provide the capability during route planning to display content equivalent to a paper chart, with full details of symbols. [Derived 2.4, page 23, paragraph 4.1.3 (a)]

(see note 215)

10.3.2 Level of SENC Detail Reduction

ECDIS shall provide the capability during route planning to reduce the detail to route monitoring level for a final check that sufficient information, and not too much information, will be shown once the ship is under way. [2.4, page 23, paragraph 4.1.3 (a)]

10.4 Planned Route Definition

10.4.1 Interactive Placement of Waypoints

ECDIS shall provide the capability to locate and identify planned route waypoints to support route planning.

10.4.1.1 Placement of Waypoints by Key-in

ECDIS shall provide the capability to locate and identify planned route waypoints by key-in of latitude and longitude.

10.4.1.2 Placement of Waypoints by Cursor

ECDIS shall provide the capability to locate and identify planned route waypoints by cursor on the Display.

10.4.2 Identify or Name Waypoints

ECDIS shall provide the capability to associate an identification number or alphanumeric name with a waypoint.

10.4.3 Linkage of Waypoints Comprising a Planned Route

ECDIS shall provide the capability to link waypoints comprising a planned route or segment of a planned route.

10.4.3.1 Linkage of Waypoints via Cursor

ECDIS shall provide the capability to link waypoints comprising a planned route or segment of a planned route via cursor identification on the display.

10.4.3.2 Linkage of Waypoints via Name or ID

ECDIS shall provide the capability to link waypoints comprising a planned route or segment via interactive input of identification number or name of all waypoints comprising the route.

10.4.4 Identify or Name a Planned Route

ECDIS shall provide the capability to associate an identification number or alphanumeric name to a planned route or segment of a planned route.

10.4.5. Storage of Planned Route

ECDIS shall provide the capability to store linked waypoints comprising a planned route or segment of a planned route for future use in route planning or route monitoring.

10.4.6 Selection of Existing Routes

ECDIS shall provide the capability to select and retrieve previously stored planned route waypoints to support route planning.

10.4.6.1 Select by Route Identification

10.4.6.1.1 Input of Route ID Number or Name

ECDIS shall provide the capability to select all waypoints comprising a specific pre-planned route by interactively specifying the planned route ID number or name.

10.4.6.1.2 Selection from Available Routes

ECDIS shall provide the capability to select all waypoints comprising a specific pre-planned route by interactively selecting it from a list of available routes.

10.4.6.1.2.1 List Routes within Rectangular Geographic Area

ECDIS shall provide the capability to list all pre-planned routes within a specified geographic area interactively entered by the user as two diagonally opposed points.

10.4.6.1.2.2 List Routes within Geographic Area Polygon

ECDIS shall provide the capability to list all pre-planned routes within a specified geographic area interactively entered by the user as a polygon consisting of up to 99 sides.

10.4.6.2 Selection of Route from Index Map

ECDIS shall provide the capability to select all waypoints and courses comprising a pre-planned route by interactively selecting route from an index map as described in paragraph 14.1.7.

10.5 Edit Waypoint and Route Data

10.5.1 Delete Waypoint

ECDIS shall provide the capability to delete an existing waypoint.

10.5.2 Move Waypoint

ECDIS shall provide the capability to change the location (position) of an existing waypoint.

10.5.3 Rename Waypoint

ECDIS shall provide the capability to change the name or ID of an existing waypoint.

10.5.4 (requirement deleted due to duplication by requirement 11.5.1)

10.5.5 Add Waypoint to Route

ECDIS shall provide the capability to link a new waypoint to an existing route.

10.5.6 (deleted)

10.5.7 Rename Route

ECDIS shall provide the capability to change the name or ID of an existing route.

10.5.8 Copy Waypoints

ECDIS shall provide the capability to copy existing waypoints to form a new route.

August 1, 1991

ECDIS SRS/Version 2.2

10.5.9 Link Existing Waypoints to Form New Route

ECDIS shall provide the capability to link existing waypoints to form a new route.

10.5.10 Delete Route

ECDIS shall provide the capability to delete an entire route, including all data linked to it.

10.6 Manage Course and Distance Data

10.6.1 Compute Course and Distance Data

ECDIS shall provide the capability to compute course and distance between waypoints associated with a planned route.

10.6.1.1 Selection of Distance Computation Method

ECDIS shall provide the capability for the user to interactively select the computational method to be utilized to compute distance between waypoints associated with a planned route.

10.6.1.2 Selection of Course Computation Method

ECDIS shall provide the capability for the user to interactively select the computational method to be utilized to compute course between waypoints associated with a planned route.

10.6.2 Store Course and Distance Data

ECDIS shall provide the capability to store all computed course and distance data associated with a planned route.

10.6.3 Display Course and Distance Data

ECDIS shall provide the capability to display on the track line all computed course and distance data associated with a planned route.

10.6.3.1 Selection of Course Units

ECDIS shall provide the capability for the user to interactively select the units for display of course between waypoints associated with a planned route.

10.6.3.1.1 Default Course Units

The default units for display of course between waypoints shall be degrees.

10.6.3.2 Selection of Distance Units

ECDIS shall provide the capability for the user to interactively select the units for display of distance between waypoints associated with a planned route.

10.6.3.2.1 Default Distance Units

The default units for display of distance between waypoints shall be nautical miles.

10.7 Management of Wheel-Over Points

10.7.1 Interactive Placement of Wheel-over Points

ECDIS shall provide the capability to locate and identify wheel-over points to support route planning.

10.7.1.1 Placement of Wheel-Over Points by Key-in

ECDIS shall provide the capability to locate and identify planned wheel-over points by key-in of latitude and longitude.

10.7.1.2 Placement of Wheel-Over Points by Cursor

ECDIS shall provide the capability to locate and identify planned wheel-over points by cursor on the SENC Display.

10.7.2 Linkage of Wheel-Over Points to a Planned Route

ECDIS shall provide the capability to link wheel-over points to a planned route or segment of a planned route.

10.7.3 Storage of Linked Wheel-Over Points

ECDIS shall provide the capability to store wheel-over points linked to a planned route or segment of a planned route for future use in route planning or route monitoring.

10.7.4 Edit of Wheel-Over Points

10.7.4.1 Delete Wheel-Over Point

ECDIS shall provide the capability to delete an existing wheel-over point.

10.7.4.2 Move Wheel-Over Point

ECDIS shall provide the capability to change the location (position) of an existing wheel-over point.

10.7.4.3 (requirement deleted due to duplication by requirement 11.6.4.4.1)

10.7.4.4 Add Wheel-Over Point to Route

ECDIS shall provide the capability to link a new wheel-over point to an existing route.

10.7.4.5 Delete all Wheel-Over Points on a Route

ECDIS shall provide the capability to delete all wheel-over points associated with an existing route.

10.8 Management of Ship Turn Data

10.8.1 Interactive Entry of Turn Data

10.8.1.1 Entry of Turn Radius

ECDIS shall provide the capability to interactively enter turn radius for the intended turn at a wheel-over point or waypoint.

10.8.1.2 Computation of Turn Rate

ECDIS shall provide the capability to compute turn rate based on turn radius and ship's speed on entering the turn.

10.8.1.3 Entry of Turn Rate

ECDIS shall provide the capability to interactively enter turn rate for the intended turn at a wheel-over point or waypoint.

10.8.2 Display of Turn Rate

ECDIS shall provide the capability to display the turn rate at a specific waypoint upon demand.

10.8.3 Display of Turn Radius

10.8.3.1 Graphic Display of Turn Radius

ECDIS shall provide the capability to display the turn radius at each waypoint graphically to indicate the ships actual route.

10.8.3.2 Numerical Display of Turn Radius

ECDIS shall provide the capability to display the turn radius at a specific waypoint upon demand.

10.8.4 Linkage of Ship Turn Data

10.8.4.1 Linkage of Ship Turn Data to Wheel-Over Points

ECDIS shall provide the capability to link turn data to wheel-over points comprising a planned route or segment of a planned route.

10.8.4.2 Linkage of Ship Turn Data to Waypoints

ECDIS shall provide the capability to link turn data to waypoints comprising a planned route or segment of a planned route.

10.8.5 Storage of Linked Turn Data

ECDIS shall provide the capability to store turn data linked to wheel-over points or waypoints comprising a planned route or segment of a planned route for future use in route planning or route monitoring.

10.8.6 Edit of Turn Data

10.8.6.1 Delete Turn Data

10.8.6.1.1 Delete Turn Data Linked to a Wheel-Over Point

ECDIS shall provide the capability to delete turn data linked to an existing wheel-over point.

10.8.6.1.2 Delete Turn Data Linked to a Waypoint

ECDIS shall provide the capability to delete turn data linked to an existing wheel-over point.

10.8.6.2 Add Turn Data

10.8.6.2.1 Add Turn Data to a Wheel-Over Point

ECDIS shall provide the capability to add turn data to existing wheel-over point linked to a route.

10.8.6.2.2 Add Turn Data to a Waypoint

ECDIS shall provide the capability to add turn data to existing waypoint linked to a route.

10.8.6.3 Modify Turn Data

10.8.6.3.1 Modify Turn Data Linked to a Wheel-Over Point

ECDIS shall provide the capability to modify data linked to an existing wheel-over point.

10.8.6.3.2 Modify Turn Data Linked to a Waypoint

ECDIS shall provide the capability to modify turn data linked to an existing wheel-over point.

10.9 Store and Manage Operational Parameters

10.9.1 Ship Speed Data

10.9.1.1 Input Ship Speed Data

ECDIS shall provide the capability to interactively input expected and available ship's speed between waypoints associated with a planned route.

10.9.1.2 Store Ship Speed Data

ECDIS shall provide the capability to store expected and available ship's speed between waypoints associated with a planned route.

10.9.1.3 Display Ship Speed Data

ECDIS shall provide the capability to display expected and available ship's speed between waypoints associated with an existing route.

10.9.2 Voyage Start Time

10.9.2.1 Input Start Time

ECDIS shall provide the capability to interactively input the expected start time for a voyage using a specified planned route.

10.9.2.2 Store Start Time

ECDIS shall provide the capability to store the expected start time for a voyage using a specified planned route.

10.9.2.3 Change Start Time

ECDIS shall provide the capability to revise the expected start time for a voyage using a specified planned route.

10.9.2.3.1 Interactive Change of Start Time

ECDIS shall provide the capability to revise start time interactively via key-in.

10.9.2.3.2 Automatic Change of Start Time

ECDIS shall provide the capability to revise start time automatically by reading the time from the system clock.

10.9.3 Ship Cruising Range Data

10.9.3.1 Input Ship Cruising Range Data

ECDIS shall provide the capability to interactively input ship's cruising range between waypoints associated with a planned route.

10.9.3.2 Store Ship Cruising Range Data

ECDIS shall provide the capability to store ship's cruising range between waypoints associated with a planned route.

10.9.3.3 Display Ship Cruising Range Data

ECDIS shall provide the capability to display ship's cruising range between waypoints associated with an existing route.

10.9.4 Ship Fuel Capacity Data

10.9.4.1 Input Ship Fuel Capacity Data

ECDIS shall provide the capability to interactively input ship's fuel capacity between waypoints associated with a planned route.

10.9.4.2 Store Ship Fuel Capacity Data

ECDIS shall provide the capability to store ship's fuel capacity between waypoints associated with a planned route.

10.9.4.3 Display Ship Fuel Capacity Data

ECDIS shall provide the capability to display ship's fuel capacity between waypoints associated with an existing route.

10.10 Compute Estimated Time of Arrival (ETA)

ECDIS shall provide the capability to compute time of arrival at each waypoint using voyage start time, input course, distance, speed (voyage planned speed or actual ship speed), and current between each waypoint of a planned route.

10.10.1 Display Estimated Time of Arrival (ETA)

ECDIS shall provide the capability to, on demand, display estimated time of arrival at each waypoint.

10.11 Route Plan Development

10.11.1 Compute Route Plan

ECDIS shall provide the capability to generate a route plan consisting of a tabular summary of the following significant data associated with the planned route;

- o Waypoint locations
- o Course to each waypoint
- o Distance between each waypoint
- o ETA at each waypoint
- o Speed between each waypoint
- o Bearing and distance labels off various points which the navigator will select for parallel index line
- o Navigator's voyage plan notes

(see note 54)

10.11.2 Display Route Plan

ECDIS shall provide the capability to display the tabular route summary on the display on demand.

10.11.3 Print Route Plan

ECDIS shall provide the capability to print the tabular route summary on demand.

10.12 Manage Planning Support Data

10.12.1 (requirement deleted due to duplication)

10.12.2 Display Light List Data to Support Route Planning

ECDIS shall provide the capabilities, at user demand, to display all navigation aid information contained in the U.S. Coast Guard Light List for the ENC data comprising the geographic area for which route planning is being conducted.

10.12.3 Print Light List Data to Support Route Planning

ECDIS shall provide the capabilities, at user demand, to print all navigation aid information contained in the U.S. Coast Guard Light List for the ENC data comprising the geographic area for which route planning is being conducted.

10.12.4 Display Coast Pilot Data to Support Route Planning

ECDIS shall provide the capabilities, at user demand, to display selected Coast Pilot text data pertaining to features contained in the ENC data comprising the geographic area for which route planning is being conducted.

10.12.5 Print Coast Pilot Data to Support Route Planning

ECDIS shall provide the capabilities, at user demand, to print selected Coast Pilot text data pertaining to features contained in the ENC data comprising the geographic area for which route planning is being conducted.

10.12.6 Display Radio Warning Data to Support Route Planning

ECDIS shall provide the capabilities, at user demand, to display all radio warning data received for the geographic area for which route planning is being conducted.

10.12.7 Print Radio Warning Data to Support Route Planning

ECDIS shall provide the capabilities, at user demand, to print all radio warning data received for the geographic area for which route planning is being conducted.

10.12.8 Manage Tide/Current Data

10.12.8.1 Display Tide/Current Data to Support Route Planning

ECDIS shall provide the capabilities, at user demand, to display all tide and current data received for the geographic area for which route planning is being conducted.

10.12.8.2 Print Tide/Current Data to Support Route Planning

ECDIS shall provide the capabilities, at user demand, to print all tide and current data received for the geographic area for which route planning is being conducted.

10.13 Significant Danger Data Management

10.13.1 Identify and Tabulate Significant Dangers

ECDIS shall provide the capability to identify and tabulate , by automatic entry of specific hazardous feature attributes, data regarding significant danger data along a planned route.

10.13.1.1 Identify Significant Dangers via Key-in

ECDIS shall provide the capability to identify and tabulate data regarding significant danger data along a planned route via key-in of position and textual description data.

10.13.1.2 Identify Significant Dangers using Cursor

ECDIS shall provide the capability to identify and tabulate data regarding significant danger data along a planned route by cursor identification of position and key-in of textual description data.

10.13.1.3 (requirement combined with requirement 10.13.1)

10.13.2 Compute Danger Bearings

ECDIS shall provide the capability to automatically (TBR) compute and tabulate danger bearings for all significant dangers along a planned route.

10.13.3 List of Significant Dangers and Danger Bearings

10.13.3.1 Store List of Significant Dangers and Danger Bearings

ECDIS shall provide the capability to generate and store a list of significant dangers and danger bearings for a planned route.

10.13.3.2 Display List of Significant Dangers and Danger Bearings

ECDIS shall provide the capability to display a list of significant dangers and danger bearings for a planned route.

10.13.4 Print List of Significant Dangers and Danger Bearings

ECDIS shall provide the capability to print a list of significant dangers and danger bearings for a planned route.

10.14 Perform Calculations, Transformations, and Measurements

ECDIS shall provide the capability to perform calculations, transformations, and measurements required for navigation planning purposes and described in paragraph 13.

10.15 Operator Interaction during Route Planning

ECDIS shall provide the capability for complex and extensive operator interaction during route planning, including use of the cursor to interrogate SENC features for further information.
[2.4, page 23, paragraph 4.1.3 (a)]

11. ROUTE MONITORING

11.1 Automatic Display of Planned Route

During execution of route monitoring, ECDIS shall provide the capability to display a planned route automatically whenever the SENC display includes the route or portions of the route. [2.1, page III, paragraph 5.1]

11.2 Highlight Information Vital to Navigation

ECDIS shall provide the capability, during route monitoring, to emphasize, through redundant code (e.g. by color and shape), information vital for safe navigation as described in the following paragraphs. [2.4, page 9, paragraph 2.2.5]

11.2.1 Highlight Own-Ship Contour

ECDIS shall provide the capability, during route monitoring, to emphasize own ship's safety contour, through redundant-code (e.g. by color and shape). [2.4, page 9, paragraph 2.2.5]

11.2.2 Highlight Potential Hazards

ECDIS shall provide the capability, during route monitoring, to emphasize potential hazards such as wrecks and other obstructions, through redundant-code (e.g. by color and shape). [2.4, page 9, paragraph 2.2.5]

11.2.2.1 Access to List of Significant Dangers and Danger Bearings

During route monitoring, ECDIS shall provide the capability to display and print a list of significant dangers and danger bearings for the planned route, prepared during route planning as described in paragraph 10.13.

11.2.2.2 (requirement combined with requirement 11.2.2.1)

11.3.3 Highlight Own-Ship's Planned Route

ECDIS shall provide the capability, during route monitoring, to emphasize own ship's planned route, through redundant-code (e.g. by color and shape). [2.4, page 9, paragraph 2.2.5]

11.3.3.1 Display Route Plan Summary

On demand, ECDIS shall provide the capability to display a tabular route plan summary consisting of the following significant data associated with the route;

- o Waypoint locations
- o Course to each Waypoint
- o Distance between each Waypoint
- o ETA at each waypoint
- o Speed between each waypoint
- o Other Data (TBR)

- o Planned radius which connects the track leading to a waypoint to the track away from a waypoint
- o Bearing and distance labels off various points which the navigator will select for parallel index line
- o Navigator's voyage plan notes

(see note 124)

11.3.3.2 Print Route Plan

To support route monitoring, ECDIS shall provide the capability to print the tabular route summary on demand.

11.3.4 Highlight Own-Ship's Symbol

ECDIS shall provide the capability, during route monitoring, to emphasize own ship's symbol, through redundant-code (e.g. by color and shape). [2.4, page 9, paragraph 2.2.5]

11.3.5 Highlight Own-Ship's Heading

ECDIS shall provide the capability, during route monitoring, to emphasize own ship's heading through redundant-code (e.g. by color and shape). [2.4, page 9, paragraph 2.2.5]

11.3.6 Highlight Own-Ship's Velocity Vector

ECDIS shall provide the capability, during route monitoring, to emphasize own ship's velocity vector through redundant-code (e.g. by color and shape). [2.4, page 9, paragraph 2.2.5]

11.3.7 Highlight Own-Ship's Past-Track

ECDIS shall provide the capability, during route monitoring, to emphasize own ship's immediate past-track through redundant-code (e.g. by color and shape). [2.4, page 9, paragraph 2.2.5]

11.3.8 Highlight Obligatory Instructions

ECDIS shall provide the capability, during route monitoring, to emphasize obligatory instructions such as traffic routing, etc. through redundant-code (e.g. by color and shape). [2.4, page 9, paragraph 2.2.5]

11.4 Display of Charts During Route Monitoring

11.4.1 Display Orientation

11.4.1.1 "North-Up" Orientation

ECDIS shall provide the capability to perform all route monitoring functions on a "North-up" display. (2.1, page IV, paragraph 9.1)

11.4.1.2 "Course-Up" Orientation

ECDIS shall provide the capability to perform all route monitoring functions on a "course-up" display.

11.4.1.3 Default Orientation

ECDIS shall assure the default display orientation for Route Monitoring is "North-up."
[Derived, 2.1, page IV, paragraph 9.1]

11.4.2 Use of Simplified Symbology

ECDIS shall provide the capability to use the simplified forms of SENC symbols for route monitoring. For example, buoys will be shown as colored circles, or top marks only in the case of cardinal buoys. [2.4, page 22, paragraph 4.1.3 (a)]

11.4.3 Display Point, Line and Area Features

ECDIS shall provide the capability to display point, line and area features required for navigation purposes during route monitoring. [2.1, page III, paragraph 5.2.3]

11.4.4 Display Mode

11.4.4.1 Relative Motion Display

ECDIS shall provide the capability to perform all route monitoring functions in relative motion display mode.

11.4.4.2 True Motion Display

ECDIS shall provide the capability to perform all route monitoring functions in true motion display mode. (2.1, page IV, paragraph 9.2)

11.4.4.3 Default Display Mode

ECDIS shall assure the default display mode for Route Monitoring is true motion.

11.4.4.4 Display Mode and Orientation Combinations

ECDIS shall assure that all route monitoring activities may be conducted on any combination of display orientation and mode, including:

- o Relative motion North up display,
- o Relative motion course-up display,
- o True motion North up display, (2.1, page IV, paragraphs 9.1, 9.2)
- o True motion course-up display.

11.4.5 Continuous SENC Display

11.4.5.1 SENC Display Along Route

ECDIS shall ensure that SENC data is continuously displayed along the route of ship's voyage.

11.4.5.2 SENC Display Contiguous to Route

ECDIS shall ensure that SENC data adjacent to the ship's planned route is available for display, ensuring that data is continuously displayed on the primary display should the ship depart from that route.

11.4.5.3 Display Refresh

ECDIS shall assure a blank screen is never presented to the user during route monitoring; the old chart should remain visible until the SENC cell is ready for quick draw. [2.4, page 23, paragraph 4.1.3 (a)]

11.4.5.4 Display Refresh Rate

ECDIS shall provide the capability to re-frame, in no more than 5 seconds, as the ship moves during route monitoring. [2.4, page 23, paragraph 4.1.3 (a)]

11.4.6 Automatic Chart Changing

ECDIS shall provide the capability to automatically change SENC cells at a predetermined position within the area of the chart (the chart change boundary).

11.4.6.1 Chart Changing for Alternate Display Modes

ECDIS shall provide the capability to automatically change SENC cells for relative motion as well as true motion display modes.

11.4.6.2 Chart Changing for Alternate Display Orientation

ECDIS shall provide the capability to automatically change SENC cells for course-up as well as north-up display orientation.

11.4.6.3 Manual Override of Automatic Chart Changing

ECDIS shall provide the capability for the operator to manually override the automatic SENC changing capability.

11.4.7 Display of SENCs Not Containing Vessel Location

11.4.7.1 Display of SENCs Along Planned Route

ECDIS shall provide the capability to display any available SENC containing the planned route at any time upon interactive request of the user. [2.9, page 11, paragraph 4.2.4]

11.4.7.2 Display of SENCs Contiguous to Planned Route

ECDIS shall provide the capability to display any available SENC adjacent to SENC charts containing the planned route at any time upon interactive request of the user. [Derived, 2.9, page 11, paragraph 4.2.4]

11.4.7.3 Ad-Hoc Display of On-line SENCs

ECDIS shall provide the capability to display any SENC available at any time upon interactive request of the user. [Derived, 2.9, page 11, paragraph 4.2.4]

11.4.8 Display of Charts on ECDIS Screens

ECDIS shall provide the capability to simultaneously display and view different SENC cells on each of two display screens. [2.9, page 11, paragraph 4.2.4]

11.4.9 Display of Chart Change Boundary

ECDIS shall provide the capability to display, on demand, the SENC change boundary for any electronic chart in use during route monitoring. [2.9, page 10, paragraph 4.2.1]

11.4.9.1 Interactive Modification of Chart Change Boundary

ECDIS shall provide the capability to interactively change the SENC change boundary for any electronic chart in use during route monitoring. [2.9, page 10, paragraph 4.2.1]

11.5 Use of Radar to support Route Monitoring

ECDIS shall provide the capability to receive, process, and register a video radar image to the SENC image in use during route monitoring as described in the following paragraphs. [2.9, page 12, paragraph 4.2.5]

11.5.1 Radar Display Modes

ECDIS shall provide two different and optional modes for radar image display, either blocked by (hence not visible through) land areas on the electronic chart, or, secondly, seen through the land areas. [2.9, page 12, paragraph 4.2.5]

11.5.2 Chart Selection to Support Radar

ECDIS shall provide the capability to automatically select SENC scale to support radar overlay, utilizing input received from the radar to indicate which radar scale is in use. [2.9, page 12, paragraph 4.2.5]

(see notes 30 and 31)

11.5.3 Use of ARPA Targets

ECDIS shall provide the capability to optionally display radar targets previously processed by the ARPA that is connected to the radar. [2.9, page 12, paragraph 4.2.5]

11.5.3.1 Display of ARPA Targets

Conventional and standardized ARPA targets shall be displayed on the ECDIS screen using standard symbols and colors.

11.6 Display of Own-Ship Position

11.6.1 Own-Ship Position Display Persistence

ECDIS shall provide the capability to display the own-ship's position overlayed on the display continuously during execution of route monitoring. [2.1, page III, paragraph 5.2.1]

11.6.2 Locate Own-Ship Position

ECDIS shall provide the capability to position the symbol for own-ship's position interactively. [2.1, page III, paragraph 5.2.2]

(see note 193)

11.6.3 (deleted due to duplication by requirement 9.4)

11.7 Determination of Position Within Area

ECDIS shall provide the capability to detect the own-ship's position within a geographical area for which special conditions exist (TBR). [2.1, page III, paragraph 5.2.5]

(see note 41)

11.7.1 Determination of Position Relative to Area

ECDIS shall provide the capability to detect the own-ship's position relative to the closest point of a geographical area for which special conditions exist (TBR).

(see note 42)

11.7.2 Determination of ETA at Area

ECDIS shall provide the capability to determine and display the ship's ETA at the closest point of a geographical area for which special conditions exist (TBR).

(see note 43)

11.8 Identification of Ship Track Versus Planned Route

ECDIS shall display Track and Planned Route graphics such that the track is easily differentiated from the planned route during route monitoring.

11.9 Computations, Retrieval, and Display of Track Data

ECDIS shall provide the capability to interactively retrieve and display past ship track data stored within the ECDIS system. [Derived, 2.1, page III, paragraph 5.2.3]

11.9.1 Display of Time-Labels Along Track

ECDIS shall provide the capability to display time-labels along the own-ship's track interactively at any time during route monitoring execution. [2.1, page III, paragraph 5.2.3]

11.9.1.1 Automatic Display of Time-Labels

ECDIS shall provide the capability to display time-labels along the own-ship's track automatically at user-selected intervals between 1 and 120 minutes. [2.1, page III, paragraph 5.2.3]

11.9.1.2 Heading-to-Steer to Next Waypoint

ECDIS shall provide the capability to compute a "heading to steer" value to the next waypoint in the active voyage plan.

11.9.1.3 Heading-to-Steer to Next Wheel over Point

ECDIS shall provide the capability to compute a "heading to steer" value to the next wheel over point in the active voyage plan.

11.9.1.4 Heading-to-Steer to Geographic Position

ECDIS shall provide the capability to compute a "heading to steer" value to a geographic position entered by the user.

11.9.1.5 Distance-to-Go to Next Waypoint

ECDIS shall provide the capability to compute the "distance-to-go" from the current ship's position to the next wheel over point in the active voyage plan.

11.9.1.6 Distance-to-Go to Next Wheel over Point

ECDIS shall provide the capability to compute the "distance-to-go" from the current ship's position to the next wheel over point in the active voyage plan.

11.9.1.7 Distance-to-Go to Geographic Position

ECDIS shall provide the capability to compute a "distance-to-go" to a geographic position entered by the user.

11.10 Compute Off-Track Error

ECDIS shall provide the capability to compute off-track error of the current ship's position from the computed track of the active voyage plan.

11.11 Display Movable Electronic Bearing Lines

ECDIS shall provide the capability to display free movable electronic bearing lines as required for navigation purposes during route monitoring. [2.1, page III, paragraph 5.2.3]

11.12 Display Variable Range Markers

ECDIS shall provide the capability to display variable range markers as required for navigation purposes during route monitoring. [2.1, page III, paragraph 5.2.3]

11.13 Display Fixed Range Markers

ECDIS shall provide the capability to display fixed range markers as required for navigation purposes during route monitoring. [2.1, page III, paragraph 5.2.3]

11.14 Sounding Display During Route Monitoring

11.14.1 Sounding Display Relative to Ship's Draft

ECDIS shall provide the capability to accept ship's draft as an input parameter and to display individual, discrete soundings in cyan if equal to or less than the ship's draft, and in ivory, if greater than the ship's draft. [2.9, page 14, paragraph 4.2.12]

(see note 44)

11.15 Processing of Tide Information

ECDIS shall provide the capability to interactively enter height-of-tide information from tables provided by the HO, and make compensating adjustments to ship's draft to account for changes in the tide. [2.9, page 14, paragraph 4.2.12]

(see note 206)

11.16 Navigation Related Data Queries

11.16.1 Chart Feature Data Queries

ECDIS shall provide the capability to call up additional information (for example buoy characteristics) quickly and simply, when needed during route monitoring. [2.4, page 22, paragraph 4.1.3 (a)]

11.16.2 Display of Navigation Related Data

ECDIS shall provide the capability to display, during route monitoring, the following navigation-related data:

- o Speed
- o Heading
- o Course

August 1, 1991

ECDIS SRS/Version 2.2

- o Position
- o Wind Speed and Direction
- o Temperature
- o Humidity (Barometric Pressure)
- o Set & Drift
- o SENC data
- o Depth Soundings
- o Time and distance to a place for which special conditions (TBR) exist

(see note 198)

11.17 (moved to 8.18.16)

11.18 Course and Speed Vectors

11.18.1 Default Course and Speed Vector

The default length of the course vector (line) shall be six minutes and the default length of the speed vector shall be set to two minutes. [2.18]

(see note 140)

11.18.2 User-Defined Course and Speed Vector

ECDIS shall provide the capability for the user to select the length of the course and speed vector.

11.19 Processing and Display of Current Information

ECDIS shall provide the capability to compute the following current information making compensating adjustments for time and display with appropriate symbols and numerics for the navigator:

- o Time of flood and ebb currents
- o Strength of flood and ebb currents
- o Times of intervening slacks or minima
- o Speed of current
- o Hourly current movement
- o Other (TBR)

11.19.1 Input Current Data

11.19.1.1 Interactive Input of Current Data

ECDIS shall provide the capability to interactively input the expected current between waypoints associated with a planned route.

11.19.1.2 Automatic Input of Current Data

August 1, 1991

ECDIS SRS/Version 2.2

Page 101

ECDIS shall provide the capability to automatically input the expected current from current tables between waypoints associated with a planned route.

11.19.2 Store Current Data

ECDIS shall provide the capability to store the expected current between waypoints associated with a planned route.

11.19.3 (deleted)

11.19.4 Display of Current Information

ECDIS shall provide the capability to display current information, by symbol and speed, during route monitoring.

12. HISTORY TRACKING

12.1 Storage of Own-Ship Track Data

ECDIS shall provide for the automatic and permanent recording of principal navigational elements of the voyage as described in the following paragraphs. [2.9, page 13, paragraph 4.2.9, derived 2.1, page II, paragraph 5.2.3]

12.1.1 Vessel Position Recording

ECDIS shall provide the capability to collect vessel positions in latitude and longitude, at selected intervals, with an accompanying record of clock time and calendar data, recorded to a precision of the nearest second of time. [2.9, page 13, paragraph 4.2.9]

12.1.1.1 Vessel Position Collection Default

The default collection interval for vessel position collection interval shall be (TBR).

(see note 153)

12.1.2 Vessel Position Collection Interval Selection

ECDIS shall provide the capability to interactively set the vessel position collection interval, the minimum collection interval shall be one second, the maximum shall be (TBR).

(see note 68)

12.1.3 Vessel Speed Recording

ECDIS shall provide the capability to collect vessel speed data at the same collection interval established for vessel position. [2.9, page 13, paragraph 4.2.9]

12.1.4 Vessel Course Recording

ECDIS shall provide the capability to collect vessel course at the same collection interval established for vessel position. [2.9, page 13, paragraph 4.2.9]

12.1.5 Vessel Rudder Angle Recording

ECDIS shall provide the capability to collect ordered and actual rudder angle data at the same collection interval established for vessel position. [2.9, page 13, paragraph 4.2.9]

12.1.6 Chart Display Configuration Data

ECDIS shall provide the capability to collect a record of the SENC cell(s) on display on both ECDIS monitors at the same collection interval established for vessel position. [2.9, page 13, paragraph 4.2.9; Derived 2.1, page III, paragraph 5.3]

12.1.7 Record of Chart Updates

ECDIS shall provide the capability to collect a record of the time, content, and mode of communication involved in the receipt and/or request for SENC updating data during the period established for collection of vessel position data.

12.1.8 Plan Variance Data

ECDIS shall provide the capability to record variances to the active voyage place, including distance and time off track, course to steer, time to next waypoint, and time to next wheel over point.

12.1.8.1 Variance in Plan Text Display

ECDIS shall provide the capability to provide a separate display of variances to the voyage plan at user request.

12.1.8.2 Variance in Plan Text Report

ECDIS shall provide the capability to print a report of variances to the voyage plan at user request.

12.2 Storage Interval for Own-Ship Track Data

ECDIS shall provide the capability to automatically store own-ship track data for at least eight hours. [2.1, page II, paragraph 5.2.3]

12.3 Preparation of Ship's Log

ECDIS shall provide the capability to condense and format own-ship track data into a report suitable for use as a ship's log. [2.9, page 14, paragraph 4.2.13]

12.3.1 Ship Log Summary Report

ECDIS shall provide the capability to produce a ship log summary report that incorporates the data of the previous eight hours for use by watch officers, especially at the time of relieving the watch. [2.9, page 14, paragraph 4.2.9; Derived, 2.1, page III, paragraph 5.3]

12.4 Reconstruction of EC Display From History Information

ECDIS shall provide the capability to reproduce minimum elements of the display stored and reconstruct the past navigation performed utilizing the ECDIS during the previous eight hours. [2.1, page III, paragraph 5.3]

12.5 Reconstruction of Own-Ship Track Data

ECDIS shall provide the capability to reconstruct own-ship track data stored to reconstruct past ship tracks. [2.1, page II, paragraph 5.2.3]

13. CALCULATIONS, MEASUREMENTS, AND COMPUTATIONS

ECDIS shall provide the capability to execute all navigational routines which are currently done by hand on the paper chart and described in the following paragraphs. [Derived, 2.2, page 7, paragraph 4.1]

13.1 Position Display

13.1.1 Latitude and Longitude Position Display

ECDIS shall provide the capability to interactively enter, display, and read geographical coordinates of any position within a SENC display. [2.1, page III, paragraph 5.2.4; 2.2, page 18, paragraph 8.2.1]

13.1.2 Projection (Grid) Coordinate Display

ECDIS shall provide the capability to interactively enter, display, and read Projection (Grid) coordinates of any position within a SENC display. [2.1, page III, paragraph 5.2.4; 2.2, page 18, paragraph 8.2.1]

13.2 Perform Projection Calculations

13.2.1 Compute True Distance

ECDIS shall provide the capability to compute true distance between two geographical positions. [2.2, page 18, paragraph 8.2.3; Derived 2.2, page 19, paragraph 8.2.5]

13.2.2 Compute Grid Distance

ECDIS shall provide the capability to compute the distance and azimuth between two projected (grid) positions. [Derived, 2.2, page 18, paragraph 8.2.3; 2.2, page 19, paragraph 8.2.5]

13.2.3 Compute Geodetic Azimuth

ECDIS shall provide the capability to compute the geodetic azimuth between two geographical positions. [2.2, page 18, paragraph 8.2.3; Derived 2.2, page 19, paragraph 8.2.5]

13.2.4 True Bearing

ECDIS shall provide the capability to input and process true bearing data to support route planning and monitoring.

13.2.5 Compute Geographic Position at Known Azimuth and Distance

ECDIS shall provide the capability to compute distance and azimuth to a specified point whose position is unknown from a known geographic position. [Derived, 2.2, page 18, paragraph 8.2.4]

13.2.6 Compute Geographic Position at Known Bearing and Distance

ECDIS shall provide the capability to compute distance and bearing to a point whose position is unknown from a known geographic position. [Derived, 2.2, page 18, paragraph 8.2.4]

13.2.7 Position Determination

13.2.7.1 Position Determination from Hyperbolics

ECDIS shall provide the capability to determine point position from hyperbolics, using HO-provided fixed error corrections where applicable. [Derived, 2.2, page 19, paragraph 8.2.6]

13.2.7.1.1 Least Squares Hyperbolic Position Determination

ECDIS shall provide the capability to determine point position from hyperbolics, utilizing least square solutions. [Derived, 2.2, page 19, paragraph 8.2.6]

13.2.7.2 Position Determination from Pseudo Ranges

ECDIS shall provide the capability to determine point position from pseudo ranges. [Derived, 2.2, page 19, paragraph 8.2.6]

13.2.7.2.1 Least Squares Pseudo Range Position Determination

ECDIS shall provide the capability to determine point position from psuedo ranges utilizing least square solutions. [Derived, 2.2, page 19, paragraph 8.2.6]

13.2.7.3 Position Determination from Dead Reckoning

ECDIS shall provide the capability to determine point position from dead reckoning. [Derived, 2.2, page 19, paragraph 8.2.6]

13.2.8 Rhumb Line Calculations

ECDIS shall provide the capability to perform projection rhumb line calculations. [2.2, page 19, paragraph 8.2.5] (delete requirement)

(see note 72)

13.2.9 Convergence Calculations

ECDIS shall provide the capability to perform projection convergence calculations. [2.2, page 19, paragraph 8.2.5] (delete requirement)

(see note 73)

13.2.10 Great Circle on a Grid Calculations

ECDIS shall provide the capability to perform projection great circle on a grid calculations. [2.2, page 19, paragraph 8.2.5] (delete requirement)

(see note 74)

13.2.11 True Circle Calculations

ECDIS shall provide the capability to perform projection true circles (geodetic) calculations. [2.2, page 19, paragraph 8.2.5] (delete requirement)

(see note 75)

13.2.12 Great Circle Calculations

ECDIS shall provide the capability to perform projection great circles calculations. [2.2, page 19, paragraph 8.2.5] (delete requirement)

(see note 76)

13.2.13 Accuracy of Calculations with respect to Rhumb Line

The accuracy of ECDIS calculations shall be such that there is no visible distortion on the display between the rhumb line and chart data. [Derived, 2.2, page 19 paragraph 8.2]

13.2.14 Accuracy of Calculations with respect to Great Circle

The accuracy of ECDIS calculations shall be such that there is no visible distortion on the display between the great circle and chart data. [Derived, 2.2, page 19 paragraph 8.2]

13.3 Magnetic Bearing

ECDIS shall provide the capability to display magnetic bearing.

13.4 Magnetic Variation

ECDIS shall provide the capability to display magnetic variation.

13.5 Arithmetic Calculations

13.5.1 Addition

ECDIS shall provide the capability to add sequences of numbers interactively input.

13.5.2 Subtraction

ECDIS shall provide the capability to subtract sequences of numbers interactively input.

13.5.3 Multiplication

August 1, 1991

ECDIS SRS/Version 2.2

ECDIS shall provide the capability to multiply sequences of numbers interactively input.

13.5.4 Division

ECDIS shall provide the capability to divide sequences of numbers interactively input.

13.5.5 Square Root

ECDIS shall provide the capability to compute the square root of numbers interactively input.

13.5.6 Sine

ECDIS shall provide the capability to compute the sine (SIN) of a angle interactively input in degrees, minutes, and seconds; decimal degrees; or degrees and decimal minutes.

13.5.7 Cosine

ECDIS shall provide the capability to compute the cosine (COS) of a angle interactively input in degrees, minutes, seconds; decimal degrees; or degrees and decimal minutes.

13.5.8 Tangent

ECDIS shall provide the capability to compute the tangent (TAN) of a angle interactively input in degrees, minutes, seconds; decimal degrees; or degrees and decimal minutes.

13.5.9 Arc Sine

ECDIS shall provide the capability to compute the arc sine (ASIN) of an interactively input value.

13.5.10 Arc Cosine

ECDIS shall provide the capability to compute the arc cosine (ACOS) of an interactively input value.

13.5.11 Arc Tangent

ECDIS shall provide the capability to compute the arc tangent (ATAN) of an interactively input value.

13.5.12 (requirement deleted because functionality identified as not needed)

13.6 Unit Conversions

13.6.1 Feet/Tenths to Fathoms/Feet Conversion

ECDIS shall provide the capability to convert interactively input data in feet/tenths to fathoms/feet.

13.6.2 Feet/Fractions to Fathoms/Feet Conversion

ECDIS shall provide the capability to convert interactively input data in feet/fractions to fathoms/feet.

13.6.3 Feet/Fractions to Fathoms/Fractions Conversion

ECDIS shall provide the capability to convert interactively input data in feet/fractions to fathoms/fractions of fathoms.

13.6.4 Feet/Tenths to Fathoms/Fractions Conversion

ECDIS shall provide the capability to convert interactively input data in feet/tenths to fathoms/fractions of fathoms.

13.6.5 Meters to Fathoms/Feet Conversion

ECDIS shall provide the capability to convert interactively input data in meters to fathoms/feet.

13.6.6 Meters to Fathoms/Fractions Conversion

ECDIS shall provide the capability to convert interactively input data in meters to fathoms/fractions of fathoms.

13.6.7 Fathoms/Feet to Feet/Tenths Feet Conversion

ECDIS shall provide the capability to convert interactively input data in fathoms/feet to feet/tenths feet.

13.6.8 Fathoms/Fractions to Feet/Tenths Feet Conversion

ECDIS shall provide the capability to convert interactively input data in fathoms/fractions to feet/tenths feet.

13.6.9 Fathoms/Fractions to Feet/Fractions Conversion

ECDIS shall provide the capability to convert interactively input data in fathoms/fractions to feet/fractions of feet.

13.6.10 Fathoms/Feet to Feet/Fractions Conversion

ECDIS shall provide the capability to convert interactively input data in fathoms/feet to feet/fractions of feet.

13.6.11 Fathoms/Fractions to Meters Conversion

ECDIS shall provide the capability to convert interactively input data in fathoms/fractions to meters.

13.6.12 Fathoms/Feet to Meters Conversion

ECDIS shall provide the capability to convert interactively input data in fathoms/feet to meters.

13.6.13 Decimal Degrees to Degrees, Minutes, Seconds Conversion

ECDIS shall provide the capability to convert interactively input data in decimal degrees to degrees, minutes, seconds.

13.6.14 Degrees, Minutes, Seconds to Decimal Degrees Conversion

ECDIS shall provide the capability to convert interactively input data in degrees, minutes, seconds to decimal degrees

13.6.15 Decimal Degrees to Degrees and Decimal Minutes Conversion

ECDIS shall provide the capability to convert interactively input data in decimal degrees to degrees and decimal minutes.

13.6.16 Degrees, Minutes, Seconds to Degrees and Decimal Minutes Conversion

ECDIS shall provide the capability to convert interactively input data in degrees, minutes, seconds to degrees and decimal minutes.

13.6.17 Degrees and Decimal Minutes to Decimal Degrees Conversion

ECDIS shall provide the capability to convert interactively input data in degrees and decimal minutes to decimal degrees.

13.6.18 Degrees and Decimal Minutes Conversion to Degrees, Minutes, Seconds.

ECDIS shall provide the capability to convert interactively input data in degrees and decimal minutes to degrees, minutes, seconds.

13.6.19 Nautical Miles to Statute Miles Conversion

ECDIS shall provide the capability to convert interactively input data in nautical miles to statute miles.

13.6.20 Statute Miles to Nautical Miles Conversion

ECDIS shall provide the capability to convert interactively input data in statute miles to nautical miles.

13.6.21 Knots to Statute Miles Conversion

ECDIS shall provide the capability to convert interactively input data in knots to statute miles.

13.6.22 Knots to Kilometers Conversion

ECDIS shall provide the capability to convert interactively input data in knots to kilometers.

13.6.23 Statute Miles to Kilometers Conversion

ECDIS shall provide the capability to convert interactively input data in statute miles to kilometers.

13.6.24 Kilometers to Statute Miles Conversion

ECDIS shall provide the capability to convert interactively input data in kilometers to statute miles.

13.7 Projection Management

13.7.1 Coordinate Transformation

ECDIS shall support transformations among geographic, geocentric (USR), projection, secondary projection (e.g. grid), and display units (uor).

13.7.2 Spheroids

ECDIS shall support the following spheroids as predefined algorithms for coordinate reference.

- o Airy (meters)
- o Bessel (meters)
- o Clark 1866 (feet)
- o Clark 1866 (meters)
- o Clark 1880 (meters)
- o Everest (meters)
- o GRS 80 (meters)
- o International (meters)
- o WGS 72 (meters)
- o WGS 84 (meters)

(see note 78)

13.7.3 Map Projections and Coordinate Systems

ECDIS shall support the following projections and coordinate systems as predefined algorithms for coordinate projection.

- o Universal Transverse Mercator
- o Universal Polar Stereographic

August 1, 1991

ECDIS SRS/Version 2.2

- o Mercator
- o Lambert Conformal Conic
- o Transverse Mercator
- o Azimuthal Equidistant
- o Polyconic
- o Albers Equal Area Conic
- o Oblique Mercator

(see note 79)

13.7.4 Horizontal Geodetic Datum Transformations

ECDIS shall support horizontal geodetic datum transformations on geographic coordinates as follows: [2.2, page 18, paragraph 8.2.2]

- o NAD 1927 to/from WGS 84 (NAD 83)
- o NAD 1927 (Alaska) to/from WGS 84 (NAD 83)
- o NAD 1927 (Canada) to/from WGS 84 (NAD 83)

(see note 80)

13.8 (requirement deleted due to duplication of requirement 11.7.7)

13.9 (requirement deleted due to statement of non-requirement)

13.10 Use of HO Conversion Tables

ECDIS shall ensure that conversions of data to ENC units are made using available HO-approved conversion constants.

13.11 Validation of Conversions (moved from 7 ?)

ECDIS shall provide the capability to demonstrate the correctness of any conversions made to HO-supplied ENC data by converting the HO data to internal format, and then back to the HO format without any change in the resultant data. [2.2, page 12, paragraph 6.2.5]

13.12 Time Data Management

ECDIS shall provide the capability to maintain and display time as described in the following paragraphs.

13.12.1 Maintain Internal Time

ECDIS shall provide the capability to maintain accurate internal time to an accuracy of one minute over a period of one week. [2.18]

(see note 200)

13.12.2 Display UTC (GMT) Time

ECDIS shall provide the capability to display UTC time at user option.

13.12.3 Display Local Time

ECDIS shall provide the capability to display local time at user option.

13.12.4 Manage and Update Time Zone Variations

ECDIS shall provide the capability to manage and update time zone variations from UTC (GMT) to compute local time.

13.12.5 Manage Temporary Time Zone Variables

ECDIS shall provide the capability to manage temporary time zone variations from UTC (GMT) to compute local time (e.g. daylight savings time).

13.12.6 Display Time in Selected Zone

ECDIS shall provide the capability to compute and display the time in any user selected time zone.

13.12.7 Display Time Based on Ship Position

ECDIS shall provide the capability to automatically display time in the local time zone indicated by the ship position.

13.12.8 Display Time in Selected Position

ECDIS shall provide the capability to automatically display time in the local time zone selected indicated by the user on the SENC (or index map).

13.12.9 Time Zone Alert

ECDIS shall provide the capability to automatically alert the user whenever a new time zone is entered during a voyage.

13.12.10 Reset Time

ECDIS shall provide the capability to reset the internal clock when required. [2.18]

13.13 Wind Velocity and Direction

ECDIS shall provide the capability to compute true wind velocity and direction from ship's data relative to ship movement, heading and speed.

14. INDEXES, CATALOG, AND LIBRARY MANAGEMENT

14.1 Chart Index

14.1.1 General Requirement

ECDIS shall have available for display, as required, a chart scale index similar to a paper chart catalogue. [2.4, page 24, paragraph 4.1.5]

14.1.2 Display Requirements

14.1.2.1 Display On-Line System Electronic Navigation Chart Outlines

ECDIS shall provide the capability to display the outlines of system electronic charts available online.

14.1.2.2 Display Off-Line System Electronic Navigation Chart Outlines

ECDIS shall provide the capability to display the outlines of system electronic charts available but stored off-line.

14.1.2.3 Display On-Line Electronic Navigation Chart Data Cell Outlines

ECDIS shall provide the capability to display the outlines of HO-supplied ENC electronic chart data available online.

14.1.2.4 Display Off-Line Electronic Navigation Chart Data Cell Outlines

ECDIS shall provide the capability to display the outlines of HO-supplied electronic chart data available but stored off-line.

14.1.2.5 Display Chart Outlines

ECDIS shall provide the capability to display the outlines of traditional navigation charts.

14.1.2.6 Display Planned Routes

ECDIS shall provide the capability to display pre-planned routes composed of waypoints.

14.1.3 Related Information Display

14.1.3.1 Display Related SENC Information

On demand, the index map shall provide the capability to display the following information relative to a SENC cell selected on the index map (TBR).

(see note 81)

14.1.3.2 Display Related ENC Information

On demand, the index map shall provide the capability to display the following information relative to the HO-supplied ENC data set selected on the index map (TBR).

(see note 81)

14.1.3.3 Display Related Chart Information

On demand, the index map shall provide the capability to display the following information relative to a navigation chart selected on the index map (TBR).

14.1.3.4 Display Planned Route Related Data

On demand, the index map shall provide the capability to display the following information relative to a pre-planned navigation route selected on the index map (TBR).

14.1.4 Display Generalized Coastlines

The index map shall contain generalized coastlines indicative of the area of operations that the ECDIS supports.

14.1.5 Index Map Zooming

ECDIS shall provide the capability to zoom in or zoom out on the index map.

14.1.6 Display of Ancillary Data Outlines

ECDIS shall provide the capability to display the outlines of the following ancillary data available online:

- o Coast Pilot Text Data
- o Light List Data
- o Radio Navigational Aids Publication 117 Data
- o General NTM Data
- o Tide Prediction Tables Data
- o Tidal Current Tables Data
- o Tidal Current Charts Data
- o Tidal Current Diagrams Data
- o Tide Tables Data
- o Current Diagrams Data
- o Others (TBR)

14.1.7 Index Map Query and Selection Functions

ECDIS shall provide the capability to query and select SENC databases and ship route plan data by interactively selecting outlines representing the data from an index map as described in the following paragraphs:

14.1.7.1 Select by Rectangular Fence on Index Map

ECDIS shall provide the capability to select SENC databases or route plan data within a specified geographic area by defining two diagonally opposed points on the index map.

14.1.7.2 Select by Polygonal Fence on Index Map

ECDIS shall provide the capability to select SENC databases or route plan data within a specified geographic area by a polygon consisting of up to 99 sides on the index map.

14.1.7.3 Select by Rectangular Fence and Scale on Index Map

ECDIS shall provide the capability to select SENC databases of a specified scale within a specified geographic area by defining two diagonally opposed points on the index map.

14.1.7.4 Select by Polygonal Fence and Scale on Index Map

ECDIS shall provide the capability to select SENC databases of a specified scale within a geographic area specified by a polygon consisting of up to 99 sides on the index map.

14.1.7.5 Select by Outline

ECDIS shall provide the capability to select an individual SENC database or route plans by its displayed outline.

14.1.8 Maintenance of Index Map

ECDIS shall provide the capability to maintain data required to support index map function as described in the following paragraphs.

14.1.8.1 Load and Store Shoreline Data

ECDIS shall provide the capability to load and store generalized shoreline data provided in IHO DX-90 format by the appropriate HO.

14.1.8.1.1 Replace Existing Shoreline Data

ECDIS shall provide the capability to replace existing shoreline data files with new editions of data as supplied by the HO.

14.1.8.2 Load and Store ENC and Chart Outlines

ECDIS shall provide the capability to load and store ENC and SENC outline data provided in IHO DX-90 format by the appropriate HO.

14.1.8.2.1 Replace Existing ENC and Chart Outlines

ECDIS shall provide the capability to replace individual ENC and SENC outlines with new editions of data as supplied by the HO.

14.1.8.3 Generate and Store SENC Outlines

ECDIS shall provide the capability to interactively generate and store SENC outlines as needed for display and query on the index map.

14.1.8.3.1 Delete Existing SENC Outlines

ECDIS shall provide the capability to delete individual SENC outlines as they become outdated or inaccurate.

14.1.8.4 Generate and Store User Defined Boundary Polygons

ECDIS shall provide the capability to interactively generate and store user defined boundary polygons as needed for display and query on the index map.

14.1.8.4.1 Delete Existing Boundary Polygons

ECDIS shall provide the capability to delete individual boundary polygons as they become outdated or inaccurate.

14.1.8.5 Generate and Store User Defined Boundary Lines

ECDIS shall provide the capability to interactively generate and store user defined boundary lines as needed for display on the index map.

14.1.8.5.1 Delete Existing Boundary Lines

ECDIS shall provide the capability to delete individual boundary lines as they become outdated or inaccurate.

14.1.8.6 Index Map Display Initialization

ECDIS shall provide the same capability to establish, review, and edit index map content definitions and display hierarchies as described in paragraph 17.6.

14.1.8.7 Index Map Display Color Management

ECDIS shall provide the same capability to establish, review, and edit index map color assignments as described in paragraph 17.7.

14.1.8.8 Index Map Symbol Management

ECDIS shall provide the same capability to create, add, delete, review, and edit index map symbology as described in paragraph 17.8.

14.1.9 Display of Index Map

14.1.9.1 Index Map Display Symbology

To the extent it is reasonable and appropriate, the index map display shall conform to the color and symbology standards adopted by IHO for ECDIS.

14.1.9.2 Index Map Screen Display

ECDIS shall provide the capability to display the index map as a full screen display or within a window on the route monitoring display.

14.2 Catalogs

14.2.1 Chart Catalog

ECDIS shall include the capability to list the title, number, area limits, scale, issue date, updates, etc., of all charts in the ENC where the ENC content is a collection of individual charts. [2.3, page 14, paragraph 7.4]

14.2.2 (deleted due to duplication by requirement 14.1.3.2)

14.2.3 Coast Pilot Catalog

ECDIS shall include the capability to list title and edition date of all Coast Pilots stored within the system.

14.3 Libraries

14.3.1 Presentation Library

ECDIS shall provide an annotated ECDIS Presentation Library, available for display on demand, to familiarize the mariner with the symbols used on ECDIS, and for general reference.

14.3.1.1 Presentation Library Abbreviations

The annotated Presentation library shall include abbreviations and symbol descriptions, including all those currently listed in sections IG, IO, IV, and IW of INT1. [2.2, page 10, paragraph 5.5; 2.4, page 29, paragraph 4.3.2]

15. USER INTERFACE

15.1 General Requirement

ECDIS shall provide ease of operation to preserve safety of navigation, such that there should be no danger of the operator becoming confused when under stress, and so losing vital chart information or clarity of display. [2.4, page 9, paragraph 2.2.6]

15.2 Use of Single Action Controls

ECDIS shall provide simple commands for frequently needed controls, such as "show buoy characteristics". [2.4, page 9, paragraph 2.2.6]

(see note 136)

15.2.1 Maximum Number of Single Action Controls

ECDIS shall provide no more than a few single-action controls for critical commands (e.g. "radar on/off" and "restore standard display"). [2.4, page 9, paragraph 2.2.6]

(see note 90)

15.3 (deleted due to subjectivity)

15.4 (requirement deleted due to duplication)

15.5 Route Monitoring Interface

ECDIS shall limit operator interaction for route monitoring to the features shown on the standard display, to warnings and alarms, to single-action controls, or simple commands (e.g. display/remove all buoy light characteristics) during route monitoring. [2.4, page 23, paragraph 4.1.3 (a); 2.4, page 22, paragraph 4.1.3 (a)]

15.5.1 Response to Operator Instructions During Route Monitoring

ECDIS shall acknowledge operator instructions immediately during route monitoring. [2.4, page 23, paragraph 4.1.3 (a)]

15.5.2 Route Monitoring Function Selection

ECDIS shall provide the capability to change from one route monitoring function to the other on the display immediately. [2.1, page IV, paragraph 10.1]

15.6 Human Factors Consideration in Route Monitoring Task Execution

ECDIS shall carry out the operator's instructions during route monitoring in accordance with existing human factors tables, which take into account the complexity of the task. [2.4, page 23, paragraph 4.1.3 (a)]

15.7 Display of Alphanumeric Information During Route Monitoring

ECDIS shall display alphanumeric information on the route monitoring display only when essential. [2.4, page 33, paragraph 4.4.1]

15.8 Use of Windows

Windows will be employed where possible and desirable, and where they represent an optional method of displaying data. [2.9, page 14, paragraph 4.2.11]

15.9 User Interface Language

English shall be used as the international language within ECDIS user interfaces. [Derived, 2.2, page 15, paragraph 6.9]

16. ON-BOARD SYSTEMS INTERFACES

(see note 201)

ECDIS shall provide the capability to interface to on-board navigation-related systems as described in the following paragraphs.

16.1 Navigation-Related Data Inputs

ECDIS shall provide the capability to interface to on-board systems and receive as input the following navigation-related data:

- o Speed
- o Heading
- o Course
- o Position
- o Wind Speed and Direction
- o Temperature
- o Humidity (Barometric Pressure)
- o Set & Drift
- o SENC Data
- o Depth Soundings
- o Communications Data
- o Others (TBR)

16.2 Navigation-Related Data Outputs

ECDIS shall provide the capability to interface to on-board systems and provide as output the following navigation-related data:

- o Speed (TBR)
- o Heading (TBR)
- o Course (TBR)
- o Position (TBR)
- o SENC Data (TBR)
- o Others (TBR)

16.3 Electronic Interface Type

ECDIS shall provide the capability to electronically interface navigation-related data via the interfaces described in the following paragraphs.

16.3.1 IEEE RS232 Interface

ECDIS shall provide the capability to electronically interface navigation-related devices in accordance with the IEEE RS232 standard.

16.3.2 IEEE RS422 Interface

ECDIS shall provide the capability to electronically interface navigation-related devices in accordance with the IEEE RS422 standard.

16.3.3 Local Area Network (LAN)

ECDIS shall provide the capability to interface navigation-related devices interfaced to on-board Local Area Networks as described in the following paragraphs:

16.3.3.1 IEEE 802.3 Standard LAN

ECDIS shall provide the capability to interface navigation-related devices directly connected via an on-board LAN in accordance with the IEEE 802.3 (Ethernet) standard (TBR).

16.3.3.2 IEEE 802.5 Standard LAN

ECDIS shall provide the capability to interface navigation-related devices directly connected via an on-board LAN in accordance with the IEEE 802.5 (Token-Ring) standard (TBR).

16.3.3.3 LAN Communications Protocol

ECDIS shall provide the capability to support communications between navigation-related devices via LAN in accordance with the TCP/IP protocol (TBR).

16.3.3.4 Modem Communications

ECDIS shall provide the capability to support communication and receipt of full duplex asynchronous and synchronous data at 1200, 2400, 4800, and 9600 bits-per-second (TBR) in conformance with CCITT V.32 or CCITT V.22 protocol (TBR).

16.4 Physical Interface Standard

ECDIS shall provide the capability to physically interface to on-board navigation related devices via the standards established in the NMEA 0183 Standard for Interfacing Marine Electronic Navigational Devices, Version 1.5, dated December 1987 (TBR).

16.5 Interface Protocol

ECDIS shall provide the capability to exchange information with on-board navigation related devices via messages based on the NMEA 0183 Standard for Interfacing Marine Electronic Navigational Devices, Version 1.5, dated December 1987 (TBR).

16.6 Management of Navigation-Related Device Inputs

ECDIS shall provide the capability to manage navigation-related device inputs interfaced to the system as described in the following paragraphs:

16.6.1 Configuration of Navigation-Related Device Inputs

ECDIS shall provide the capability to configure and identify all navigation-related device inputs interfaced to the system.

16.6.2 Identification of Operational Systems

ECDIS shall provide the identity of any navigation-related device inputs interfaced to the system that are not operational and discontinue these inputs.

16.6.3 Selection of Navigation-Related Device Inputs

ECDIS shall provide the capability to select device inputs to be utilized as input from the suite of device inputs interfaced to the system.

16.6.4 Number of Inputs Interfaced

ECDIS shall provide the capability to support (TBR) navigation-related device inputs simultaneously interfaced to the system.

16.6.5 Degradation of Navigation Support Equipment Performance

ECDIS shall not degrade the performance of any equipment interfaced to the host for the purpose of providing navigation sensor inputs. [2.1, page V, paragraph 12.1]

16.6.6 Degradation of Ancillary Equipment Performance

ECDIS shall not degrade the performance of any equipment connected to it. [2.1, page V, paragraph 12.1]

16.7 Minimum On-Board System Configuration

ECDIS design shall be considered the following on-board positioning devices as the minimum configuration of on-board navigation devices required to assure safety of navigation:

- o GPS/LORAN-C/DECCA/TRANSIT
- o INMARSAT-A Data Communications Interface
- o Others (TBR)

16.8 Reduced-Configuration Operational Conditions

ECDIS shall assure those operational capabilities critical to safe navigation are provided under the reduced-configuration conditions described in the following paragraphs:

16.8.1 GPS-Only Interface

ECDIS shall provide a minimum set of functionality to support safe navigation practices under conditions in which the system is configured only to an on-board GPS receiver. (Note: GPS refers here to either GPS or Differential GPS, whichever is configured for the system)

16.8.2 LORAN C-Only Interface

ECDIS shall provide a minimum set of functionality to support safe navigation practices under conditions in which the system is configured only to an on-board LORAN-C receiver.

16.8.3 DECCA-Only Interface

ECDIS shall provide a minimum set of functionality to support safe navigation practices under conditions in which the system is configured only to an on-board DECCA receiver.

16.8.4 TRANSIT-Only Interface

ECDIS shall provide a minimum set of functionality to support safe navigation practices under conditions in which the system is configured only to an on-board TRANSIT receiver.

16.9 Global Positioning System (GPS) Receiver Interface

ECDIS shall provide the capability to directly interface to the industry standard GPS receivers as described in the following paragraphs: (Note: GPS refers here to either GPS or Differential GPS, whichever is configured for the system)

16.9.1 GPS Data Inputs

ECDIS shall provide the capability to receive and process the following data as input from GPS receivers interfaced to the system:

- o Position (latitude, longitude)
- o Indication of position precision
- o Others (TBR)

16.9.1.1 Format for GPS Input

ECDIS shall provide the capability to receive and process data input from GPS receivers in a NMEA 0183 compliant format (TBR) as described in (TBR).

16.9.2 ECDIS Outputs to GPS Receivers

ECDIS shall provide the capability to output data generated or managed by the system to GPS receivers interfaced to the system:

- o (TBR)

16.9.2.1 Format for Output to GPS Receivers

ECDIS shall provide the capability to output data generated or managed by the system to GPS receivers interfaced to the system in a NMEA 0183 compliant format (TBR) as described in (TBR).

16.9.3 GPS System Alarms

ECDIS shall provide the capability to receive, display, and sound GPS system failure alarms/messages indicating the following:

- o Fatal System Failure
- o Non-Fatal System Failure
- o Others (TBR)

16.9.3.1 Format for GPS Alarm Input

ECDIS shall provide the capability to receive, display, and sound GPS system failure alarms/messages input in a NMEA 0183 compliant format (TBR) as described in (TBR).

16.9.3.2 Persistence of GPS Alarms

ECDIS shall provide the capability to silence GPS Alarms, once activated, at the user's option.

16.10 LORAN-C Receiver Interface

ECDIS shall provide the capability to receive industry standard LORAN-C receiver output as described in the following paragraphs:

16.10.1 LORAN-C Data Inputs

ECDIS shall provide the capability to receive and process the following data as input from LORAN-C receivers interfaced to the system:

- o Position (latitude, longitude)
- o Indication of position precision
- o Signal/Noise Ratio
- o Others (TBR)

16.10.1.1 Format for LORAN-C Input

ECDIS shall provide the capability to receive and process data input from LORAN-C receivers in a NMEA 0183 compliant format (TBR) as described in (TBR).

16.10.2 ECDIS Outputs to LORAN-C Receivers

ECDIS shall provide the capability to output data generated or managed by the system to LORAN-C receivers interfaced to the system:

- o (TBR)

16.10.2.1 Format for Output to LORAN-C Receivers

ECDIS shall provide the capability to output data generated or managed by the system to LORAN-C receivers interfaced to the system in a NMEA 0183 compliant format (TBR) as described in (TBR).

16.10.3 LORAN-C System Alarms

ECDIS shall provide the capability to receive, display, and sound LORAN-C system failure alarms/messages indicating the following:

- o Fatal System Failure
- o Non-Fatal System Failure
- o Others (TBR)

16.10.3.1 Format for LORAN-C Alarm Input

ECDIS shall provide the capability to receive, display, and sound LORAN-C system failure alarms/messages input in a NMEA 0183 compliant format (TBR) as described in (TBR).

16.10.3.2 Persistence of LORAN-C Alarms

ECDIS shall provide the capability to silence LORAN-C Alarms at the user's option.

16.11 DECCA Receiver Interface

ECDIS shall provide the capability to receive industry standard DECCA receiver output as described in the following paragraphs:

16.11.1 DECCA Data Inputs

ECDIS shall provide the capability to receive and process the following data as input from DECCA receivers interfaced to the system:

- o Position (latitude, Longitude)
- o Indication of position precision
- o Blink Status
- o Cycle Status
- o Signal/Noise Ratio
- o Others (TBR)

16.11.1.1 Format for DECCA Input

ECDIS shall provide the capability to receive and process data input from DECCA receivers in a NMEA 0183 compliant format (TBR) as described in (TBR).

16.11.2 ECDIS Outputs to DECCA Receivers

ECDIS shall provide the capability to output data generated or managed by the system to DECCA receivers interfaced to the system:

- o (TBR)

16.11.2.1 Format for Output to DECCA Receivers

ECDIS shall provide the capability to output data generated or managed by the system to DECCA receivers interfaced to the system in a NMEA 0183 compliant format (TBR) as described in (TBR).

16.11.3 DECCA System Alarms

ECDIS shall provide the capability to receive, display, and sound DECCA system failure alarms/messages indicating the following:

- o Fatal System Failure
- o Non-Fatal System Failure
- o Others (TBR)

16.11.3.1 Format for DECCA Alarm Input

ECDIS shall provide the capability to receive, display, and sound DECCA system failure alarms/messages input in a NMEA 0183 compliant format (TBR) as described in (TBR).

16.11.3.2 Persistence of DECCA Alarms

ECDIS shall provide the capability to silence DECCA Alarms at the user's option. "

16.12 Gyrocompass Interface

ECDIS shall provide the capability to receive industry standard gyrocompass device output as described in the following paragraphs:

16.12.1 Gyrocompass Data Inputs

ECDIS shall provide the capability to receive and process the following data as input from gyrocompass devices interfaced to the system:

- o True Heading
- o Others (TBR)

16.12.1.1 Format for Gyrocompass Input

ECDIS shall provide the capability to receive and process data input from Gyrocompass devices in a NMEA 0183 compliant format (TBR) as described in (TBR).

16.12.2 (requirement deleted because functionality not needed)

16.12.2.1 (requirement deleted because functionality not needed)

16.12.3 Gyrocompass System Alarms

ECDIS shall provide the capability to receive, display, and sound Gyrocompass system failure alarms/messages indicating the following:

- o Fatal System Failure
- o Non-Fatal System Failure
- o Others (TBR)

16.12.3.1 Format for Gyrocompass Alarm Input

ECDIS shall provide the capability to receive, display, and sound Gyrocompass system failure alarms/messages input in a NMEA 0183 compliant format (TBR) as described in (TBR).

16.12.3.2 Persistence of Gyrocompass Alarms

ECDIS shall provide the capability to silence Gyrocompass Alarms at the users option.

16.14 TRANSIT Receiver Interface

ECDIS shall provide the capability to receive industry standard TRANSIT receiver output as described in the following paragraphs:

16.14.1 TRANSIT Data Inputs

ECDIS shall provide the capability to receive and process the following data as input from TRANSIT receivers interfaced to the system:

- o Position (latitude, longitude)
- o Indication of position precision
- o Others (TBR)

16.14.1.1 Format for TRANSIT Input

ECDIS shall provide the capability to receive and process data input from TRANSIT receivers in a NMEA 0183 compliant format (TBR) as described in (TBR).

16.14.2 ECDIS Outputs to TRANSIT Receivers

ECDIS shall provide the capability to output data generated or managed by the system to TRANSIT receivers interfaced to the system:

- o (TBR)

16.14.2.1 Format for Output to TRANSIT Receivers

ECDIS shall provide the capability to output data generated or managed by the system to TRANSIT receivers interfaced to the system in a NMEA 0183 compliant format (TBR) as described in (TBR).

16.14.3 TRANSIT System Alarms

ECDIS shall provide the capability to receive, display, and sound TRANSIT system failure alarms/messages indicating the following:

- o Fatal System Failure
- o Non-Fatal System Failure
- o Others (TBR)

16.14.3.1 Format for TRANSIT Alarm Input

ECDIS shall provide the capability to receive, display, and sound TRANSIT system failure alarms/messages input in a NMEA 0183 compliant format (TBR) as described in (TBR).

16.14.3.2 Persistence of TRANSIT Alarms

ECDIS shall provide the capability to silence TRANSIT Alarms at the users option.

16.15 Speed Log Interface

ECDIS shall provide the capability to directly interface to industry standard speed log devices as described in the following paragraphs:

16.15.1 Speed Log Data Inputs

ECDIS shall provide the capability to receive and process the following data as input from Speed Log devices interfaced to the system:

- o Dual-Axis Water Speed
- o Bottom Speed
- o Set and Drift
- o Others (TBR)

16.15.1.1 Format for Speed Log Input

ECDIS shall provide the capability to receive and process data input from Speed Log receivers in a NMEA 0183 compliant format (TBR) as described in (TBR).

16.15.2 ECDIS Outputs to Speed Log Devices

ECDIS shall provide the capability to output data generated or managed by the system to Speed Log receivers interfaced to the system:

- o (TBR)

16.15.2.1 Format for Output to Speed Log Devices

ECDIS shall provide the capability to output data generated or managed by the system to Speed Log receivers interfaced to the system in a NMEA 0183 compliant format (TBR) as described in (TBR).

16.15.3 Speed Log System Alarms

ECDIS shall provide the capability to receive, display, and sound Speed Log system failure alarms/messages indicating the following:

- o Fatal System Failure
- o Non-Fatal System Failure
- o Others (TBR)

16.15.3.1 Format for Speed Log Alarm Input

ECDIS shall provide the capability to receive, display, and sound Speed Log system failure alarms/messages input in a NMEA 0183 compliant format (TBR) as described in (TBR).

16.15.3.2 Persistence of Speed Log Alarms

ECDIS shall provide the capability to silence Speed Log Alarms at the user's option.

16.16 Depth Sounder Interface

ECDIS shall provide the capability to receive industry standard depth sounder device output described in the following paragraphs:

16.16.1 Depth Sounder Data Inputs

ECDIS shall provide the capability to receive and process the following data as input from Depth Sounder devices interfaced to the system:

- o Depth below transducer
- o Depth of water below keel
- o Depth of water below surface
- o Others (TBR)

16.16.1.1 Format for Depth Sounder Input

ECDIS shall provide the capability to receive and process data input from Depth Sounder receivers in a NMEA 0183 compliant format (TBR) as described in (TBR).

16.16.2 ECDIS Outputs to Depth Sounder Devices

ECDIS shall provide the capability to output data generated or managed by the system to Depth Sounder receivers interfaced to the system:

- o (TBR)

16.16.2.1 Format for Output to Depth Sounder Devices

ECDIS shall provide the capability to output data generated or managed by the system to Depth Sounder receivers interfaced to the system in a NMEA 0183 compliant format (TBR) as described in (TBR).

16.16.3 Depth Sounder System Alarms

ECDIS shall provide the capability to receive, display, and sound Depth Sounder system failure alarms/messages indicating the following:

- o Fatal System Failure
- o Non-Fatal System Failure
- o Measured depth less than set value
- o Others (TBR)

16.16.3.1 Format for Depth Sounder Alarm Input

ECDIS shall provide the capability to receive, display, and sound Depth Sounder system failure alarms/messages input in a NMEA 0183 compliant format (TBR) as described in (TBR).

16.16.3.2 Persistence of Depth Sounder Alarms

ECDIS shall provide the capability to silence Depth Sounder Alarms at the user's option.

16.16.3.3 Persistence of Depth Warning Alarm

ECDIS shall provide the capability to temporarily silence any audio alarm associated with a depth warning generated by an interfaced echo sounding device, but the warning message will remain on the primary graphic display as long as the condition that caused it exists.

16.17 Weather Measurement System Interface

ECDIS shall provide the capability to receive industry standard weather measurement system device output (TBR) as described in the following paragraphs:

16.17.1 Weather Measurement System Data Inputs

ECDIS shall provide the capability to receive and process the following data as input from Weather Measurement System devices interfaced to the system:

- o Temperature
- o Humidity
- o Barometric Pressure
- o Wind Direction
- o Wind Velocity
- o Others (TBR)

16.17.1.1 Format for Weather Measurement System Input

ECDIS shall provide the capability to receive and process data input from Weather Measurement System receivers in a NMEA 0183 compliant format (TBR) as described in (TBR).

16.17.2 ECDIS Outputs to Weather Measurement System Devices

ECDIS shall provide the capability to output data generated or managed by the system to Weather Measurement System receivers interfaced to the system:

- o (TBR)

16.17.2.1 Format for Output to Weather Measurement System Devices

ECDIS shall provide the capability to output data generated or managed by the system to Weather Measurement System receivers interfaced to the system in a NMEA 0183 compliant format (TBR) as described in (TBR).

16.17.3 Weather Measurement System Alarms

ECDIS shall provide the capability to receive, display, and sound Weather Measurement System failure alarms/messages indicating the following:

- o Fatal System Failure
- o Non-Fatal System Failure
- o Wind Velocity greater than a set value
- o Temperature greater than a set value (TBR)
- o Temperature less than a set value
- o Barometric pressure less than a set value
- o Barometric pressure greater than a set value (TBR)
- o Wind direction falls within a set range (TBR)
- o Others (TBR)

16.17.3.1 Format for Weather Measurement System Alarm Input

ECDIS shall provide the capability to receive, display, and sound Weather Measurement System failure alarms/messages input in a NMEA 0183 compliant format (TBR) as described in (TBR).

16.17.3.2 Persistence of Weather Measurement System Alarms

ECDIS shall provide the capability to silence Weather Measurement System Alarms at the users option.

16.18 Rudder Position Measurement Interface

ECDIS shall provide the capability to receive industry standard rudder position measurement device output (TBR) as described in the following paragraphs:

16.18.1 Rudder Position Measurement Data Inputs

ECDIS shall provide the capability to receive and process the following data as input from Rudder Position Measurement devices interfaced to the system:

- o Rudder Angle
- o Rudder Sensor Angle
- o Others (TBR)

16.18.1.1 Format for Rudder Position Measurement Input

ECDIS shall provide the capability to receive and process data input from Rudder Position Measurement devices in a NMEA 0183 compliant format (TBR) as described in (TBR).

16.18.2 ECDIS Outputs to Rudder Position Measurement Devices

ECDIS shall provide the capability to output data generated or managed by the system to Rudder Position Measurement System devices interfaced to the system:

- o (TBR)

16.18.2.1 Format for Output to Rudder Position Measurement Devices

ECDIS shall provide the capability to output data generated or managed by the system to Rudder Position Measurement devices interfaced to the system in a NMEA 0183 compliant format (TBR) as described in (TBR).

16.18.3 Rudder Position Measurement System Alarms

ECDIS shall provide the capability to receive, display, and sound Rudder Position Measurement System failure alarms/messages indicating the following:

- o Fatal System Failure
- o Non-Fatal System Failure
- o Rudder position greater than set angle value
- o Rudder position less than set angle value (TBR)
- o Position falls within a set angle range (TBR)
- o Others (TBR)

16.18.3.1 Format for Rudder Position Measurement Alarm Input

ECDIS shall provide the capability to receive, display, and sound Rudder Position Measurement System failure alarms/messages input in a NMEA 0183 compliant format (TBR) as described in (TBR).

16.18.3.2 Persistence of Rudder Position Measurement System Alarms

ECDIS shall provide the capability to silence Rudder Position Measurement System Alarms at the user's option.

16.19 Autopilot Systems Interface

ECDIS shall provide the capability to directly interface to the industry standard autopilot devices as described in the following paragraphs:

16.19.1 Autopilot Data Inputs

ECDIS shall provide the capability to receive and process the following data as input from autopilot devices interfaced to the system:

- o (TBR)

16.19.1.1 Format for Autopilot Input

ECDIS shall provide the capability to receive and process data input from autopilot devices in a NMEA 0183 compliant format (TBR) as described in (TBR).

16.19.2 ECDIS Outputs to Autopilot Devices

ECDIS shall provide the capability to output data generated or managed by the system to autopilot devices interfaced to the system:

- o (TBR)

16.19.2.1 Format for Output to Autopilot Devices

ECDIS shall provide the capability to output data generated or managed by the system to autopilot devices interfaced to the system in a NMEA 0183 compliant format (TBR) as described in (TBR).

16.19.3 Autopilot Alarms

ECDIS shall provide the capability to receive, display, and sound autopilot device system failure alarms/messages indicating the following:

- o Fatal System Failure
- o Non-Fatal System Failure
- o Others (TBR)

16.19.3.1 Format for Autopilot Alarm Input

ECDIS shall provide the capability to receive, display, and sound autopilot device system failure alarms/messages input in a NMEA 0183 compliant format (TBR) as described in (TBR).

16.19.3.2 Persistence of Autopilot Alarms

ECDIS shall provide the capability to silence autopilot alarms at the users option.

16.20 ARPA Target Data Input

ECDIS shall provide the capability to receive ARPA target data input from Radar/ARPA devices directly interfaced to the system as described in the following paragraphs.

16.20.1 ARPA Data Inputs

ECDIS shall provide the capability to receive and process the following data as ARPA target input to the system:

- o Target Identifier (optional)
- o Target Group Identifier (optional)
- o Target Range
- o Target Bearing
- o Target Course
- o Target Speed
- o Target Predicted Closest Point of Approach
- o Time to Target Predicted Closest Point of Approach
- o Potential Collision Points (optional)
- o Danger/Threat Targets (optional)
- o Lost Targets (optional)
- o Others (TBR)

16.20.1.1 Format for ARPA Input

ECDIS shall provide the capability to receive and process data input from ARPA systems described in (TBR).

16.20.2 ECDIS Outputs to ARPA Systems

ECDIS shall provide the capability to output data generated or managed by the system to ARPA systems interfaced to the system:

- o (TBR)

16.20.2.1 Format for Output to ARPA Systems

ECDIS shall provide the capability to output data generated or managed by the system to ARPA systems interfaced to the system described in (TBR).

16.20.3 ARPA Symbolology

ECDIS shall provide the capability to transfer ARPA information to radar, and vice versa using the same symbols as on the original display. [Derived, 2.3, page 10, paragraph 2.2.7]

16.20.4 (requirement deleted because functionality identified as not needed)

16.20.5 Radar/ARPA System Alarms

ECDIS shall provide the capability to receive, display, and sound Radar/ARPA system failure alarms/messages indicating the following:

- o Fatal System Failure
- o Non-Fatal System Failure
- o Target Lost (TBR)
- o Others (TBR)

16.20.5.1 Format for ARPA Alarm Input

ECDIS shall provide the capability to receive, display, and sound Radar/ARPA system alarms/messages input in a format as described in (TBR).

16.20.5.2 Persistence of Radar/ARPA Alarms

ECDIS shall provide the capability to silence Radar/ARPA Alarms at the user's option.

16.21 Radar Video Input

ECDIS shall provide the capability to receive video input from Radar devices directly interfaced to the system as described in the following paragraphs.

16.21.1 Format for Radar Video Input to ECDIS

ECDIS shall provide the capability to receive and process data video input from radar systems in a format as described in (TBR).

16.21.2 ECDIS Outputs to Radar Systems

ECDIS shall provide the capability to output data generated or managed by the system to Radar systems interfaced to the system:

- o Range Scale
- o Others (TBR)

16.21.2.1 Format for Output to Radar Systems

ECDIS shall provide the capability to output data generated or managed by the system to Radar systems interfaced to the system as described in (TBR).

16.21.3 ECDIS SENC Data Export to Radar Systems

ECDIS shall provide the capability to output the SENC feature data generated or managed by the system to Radar systems and described in (TBR).

16.21.3.1 Export Format for SENC Output to Radar Systems

ECDIS shall provide the capability to output the SENC feature data generated or managed by the system to Radar systems in a format as described in (TBR).

16.21.3.2 SENC Symbology

ECDIS shall provide the capability to transfer chart information to radar, and vice versa using the same symbols as on the original display. [2.4, page 10, paragraph 2.2.7]

16.21.4 (requirement deleted because functionality identified as not needed)

16.21.5 Radar System Alarms

ECDIS shall provide the capability to receive, display, and sound Radar system failure alarms/messages indicating the following:

- o Fatal System Failure
- o Non-Fatal System Failure
- o Others (TBR)

16.21.5.1 Format for Radar Alarm Input

ECDIS shall provide the capability to receive, display, and sound Radar system alarms/messages input in a format as described in (TBR).

16.21.5.2 Persistence of Radar Alarms

ECDIS shall provide the capability to silence Radar alarms at the users option.

16.21.6 Standard Error of Range Displays

ECDIS shall assure that ranges are displayed with an error not exceeding 1.5% of the semi-diagonal length or 70m, whichever is greater. [2.1, page IV, paragraph 7.2]

16.22 Interface of Multi-Source Position Navigation Filtering Devices

ECDIS shall provide the capability to directly interface to the industry-standard multi-source navigation data filtering devices as described in the following paragraphs:

16.22.1 Multi-Source Navigation Data Filtering Device Inputs

16.22.1.1 Minimum Data Inputs

ECDIS shall provide the capability, at a minimum, to receive and process the same data input from multi-source navigation data filtering devices interfaced to the system as would be input if the devices were directly interfaced to the system.

16.22.1.2 Filter Computation Data Inputs

ECDIS shall provide the capability to receive and process the following computational results from multi-source navigation data filtering devices interfaced to the system:

- o "Best-Fit" Position
- o Indication of Position Reliability
- o Others (TBR)

16.22.1.3 Format for Multi-Source Navigation Data Filtering Device Data

ECDIS shall provide the capability to receive and process data input from multi-source navigation data filtering devices in the format described in (TBR).

16.22.2 ECDIS Outputs to Multi-Source Navigation Data Filtering Devices

ECDIS shall provide the capability to output data generated or managed by the system to multi-source navigation data filtering devices interfaced to the system:

- o (TBR)

16.22.2.1 Format for Output to Multi-Source Navigation Data Filtering Devices

ECDIS shall provide the capability to output data generated or managed by the system to multi-source navigation data filtering devices interfaced to the system in a NMEA 0183 compliant format (TBR) as described in (TBR).

16.22.3 Multi-Source Navigation Data Filtering Devices Alarms

ECDIS shall provide the capability, at a minimum, to receive, display, and sound the same system failure alarms/messages that would be received if navigation devices managed by the multi-source navigation data filtering device were directly interfaced to the system.

16.22.3.1 Format for Multi-Source Navigation Data Filtering Device Alarm Input

ECDIS shall provide the capability to receive, display, and sound multi-source navigation data filtering device system failure alarms/messages input in a NMEA 0183 compliant format (TBR) as described in (TBR).

16.22.3.2 Persistence of Multi-Source Navigation Data Filtering Device Alarms

ECDIS shall provide the capability to silence alarms received via a multi-source navigation data filtering device at the users option.

16.23 Satellite Communications System Interface

ECDIS shall provide the capability to directly interface to industry standard INMARSAT satellite earth stations configured for shipboard use as described in the following paragraphs:

16.23.1 Communications System Data Inputs

ECDIS shall provide the capability to receive and process the alphanumeric data as input from INMARSAT satellite earth stations interfaced to the system:

16.23.1.1 Format for Communications System Input

ECDIS shall provide the capability to process data input from INMARSAT satellite earth stations received via modem in ASCII format (TBR) as described in (TBR).

16.23.2 Communications System Alarms

ECDIS shall provide the capability to receive, display, and sound INMARSAT satellite earth stations system failure alarms/messages indicating the following (TBR):

- o Fatal System Failure
- o Non-Fatal System Failure
- o Others (TBR)

16.23.2.1 Format for Communications System Alarm Input

ECDIS shall provide the capability to receive, display, and sound INMARSAT system failure alarms/messages input in a NMEA 0183 compliant format (TBR) as described in (TBR).

16.23.2.2 Persistence of Communications Alarms

ECDIS shall provide the capability to silence INMARSAT Alarms, once activated, at the user's option.

17. SYSTEM INITIALIZATION

ECDIS shall provide the capability to perform initialization and initialization data management functions as described in the following paragraphs.

17.1 ECDIS Hardware Configuration

17.1.1 Identify Display Configuration

ECDIS shall provide the capability to identify and configure primary, secondary, and auxiliary displays incorporated into the system.

17.1.2 Identify Input Devices

ECDIS shall provide the capability to identify and configure user input devices incorporated into the system.

17.1.3 Identify Mass Storage Devices

ECDIS shall provide the capability to identify and configure all mass storage devices incorporated into the system.

17.1.4 Identify Off-line Storage Devices

ECDIS shall provide the capability to identify and configure all off-line storage devices incorporated into the system.

17.1.5 Identify Printing Devices

ECDIS shall provide the capability to identify and configure all printing devices incorporated into the system.

17.2 Initialization of Navigation System Interfaces

ECDIS shall provide the capability to configure on-board navigation system interfaces as described in the following paragraphs:

17.2.1 Initialize Navigation System IDs

ECDIS shall provide the capability to establish, review, and delete on-board navigation system IDs of systems interfaced the system.

17.2.2 Identify Navigation System Interface Ports

ECDIS shall provide the capability to identify, configure, and change system interface ports to which specific on-board navigation systems are interfaced.

17.2.3 Enable/Disable Navigation System Input

ECDIS shall provide the capability to enable or disable input from specific on-board navigation systems interfaced to the system.

17.2.4 Initialize Navigation System Input Data Rate

ECDIS shall provide the capability to establish, review, and change the input data rate for specific on-board navigation systems interfaced to the system.

17.2.5 Initialize Navigation System Input Frequency

ECDIS shall provide the capability to establish, review, and change the input frequency for specific on-board navigation systems interfaced to the system.

17.2.5.1 Initialize Navigation System Input Processing Frequency

ECDIS shall provide the capability to establish, review, and change the rate at which the input from specific on-board navigation systems interfaced to the system are processed for internal use.

17.2.6 Initialize Navigation System Input Characteristics and Format

ECDIS shall provide the capability to establish, review, and change the input characteristics and format for specific on-board navigation systems interfaced to the system.

17.2.7 Define Navigation System Input Content

ECDIS shall provide the capability to establish, review, and change the input data content for specific on-board navigation systems interfaced to the system.

17.2.8 Define and Store Navigation System Data Ranges

ECDIS shall provide the capability to establish, store, review, and change data content ranges for specific on-board navigation systems interfaced to the system to support internal range checking.

17.3 Alarm and Warning Initialization

17.3.1 Initialize Warning Message Display

ECDIS shall provide the capability for the user to indicate the warning messages to be displayed during system operation from the suite of available system warning messages.

17.3.2 Initialize Warning Message Display Persistence

ECDIS shall provide the capability for the user to indicate the default length of time individual warning messages will be displayed during system operation.

17.3.3 Initialize Warning Message Text

ECDIS shall provide the capability for the user to establish, review, or edit the text of warning messages to be displayed during system operation.

17.3.4 Initialize Audible Alarm

ECDIS shall provide the capability for the user to indicate the audible alarms to be sounded during system operation from the suite of available system alarms.

17.3.5 Initialize Audible Alarm Persistence

ECDIS shall provide the capability for the user to indicate the default length of time individual alarms will be sounded during system operation.

17.3.6 Initialize Audible Alarm Type

ECDIS shall provide the capability for the user to establish, review, or edit the audible characteristics (steady, beeping, pulsing, etc.) of alarms to be sounded during system operation.

17.4 Time and Date Initialization

17.4.1 Initialize System Time/Date

ECDIS shall provide the capability to initialize time and date to coincide with an established standard (e.g. GMT).

17.4.2 Initialize Time Zone Boundaries

ECDIS shall provide the capability to initialize time zone boundaries to coincidence with established standards to support automatic computation of local time.

17.4.3 Initialize System Time Zone Deltas

ECDIS shall provide the capability to establish time zone deltas from the established standard to support automatic computation of local time.

17.4.3.1 Initialize Daylight/Standard Time Zones

ECDIS shall provide the capability to indicate time zones observing daylight savings and/or standard time to support automatic computation of local time.

17.5 Default Unit Initialization

ECDIS shall provide the capability to establish, review, and edit default units of measure utilized by the system as described in the following paragraphs:

17.5.1 Initialize Position Units

ECDIS shall provide the capability to establish, review, and edit the default units of measure for position.

17.5.2 Initialize Speed Units

ECDIS shall provide the capability to establish, review, and edit the default units of measure for speed.

17.5.3 Initialize Draft Units

ECDIS shall provide the capability to establish, review, and edit the default units of measure for ship draft.

17.5.4 Initialize Depth Units

ECDIS shall provide the capability to establish, review, and edit the default units of measure for depth.

17.5.5 Initialize Height Units

ECDIS shall provide the capability to establish, review, and edit the default units of measure for height.

17.5.6 Initialize Distance Units

ECDIS shall provide the capability to establish, review, and edit the default units of measure for distance.

17.5.7 Azimuth/Bearing.

ECDIS shall provide the capability to establish, review, and edit the default units of measure for azimuth and bearing.

17.5.8 Initialize Turn Rate Units

ECDIS shall provide the capability to establish, review, and edit the default units of measure for turn rate.

17.5.9 Initialize Wind Speed Units

ECDIS shall provide the capability to establish, review, and edit the default units of measure for wind speed.

17.5.10 Initialize Temperature Units

ECDIS shall provide the capability to establish, review, and edit the default units of measure for temperature.

17.5.11 (requirement deleted because functionality identified as not needed)

17.5.12 Initialize Time Units

ECDIS shall provide the capability to establish, review, and edit the default units of measure for time.

17.6 Display Configuration Initialization

17.6.1 Initialize Display Content

ECDIS shall provide the capability to establish, review, and edit the default display content for the system primary, secondary, and auxiliary displays.

17.6.2 Initialize Display Hierarchy

ECDIS shall provide the capability to establish, review, and edit the default display hierarchy for the system primary, secondary, and auxiliary displays.

17.6.3 Initialize Display Configuration

ECDIS shall provide the capability to establish, review, and edit the default display configuration (i.e. North-up, Course-up) for the system primary and secondary displays.

17.6.4 Initialize Display Mode

ECDIS shall provide the capability to establish, review, and edit the default display mode (i.e. True, Relative) for the system primary and secondary displays.

17.6.5 Initialize Display Alteration Parameters

ECDIS shall provide the capability to establish, review, and edit the default display configuration and mode alteration parameters for the system primary and secondary displays.

17.7 Display Color Initialization

17.7.1 Initialize Daytime Colors

ECDIS shall provide the capability to establish, review, and edit the default daytime color assignments for the system primary and secondary displays.

17.7.2 Initialize Twilight Colors

ECDIS shall provide the capability to establish, review, and edit the default twilight color assignments for the system primary and secondary displays.

17.7.3 Initialize Dusk Colors

ECDIS shall provide the capability to establish, review, and edit the default dusk color assignments for the system primary and secondary displays.

17.7.4 Initialize Night Colors

ECDIS shall provide the capability to establish, review, and edit the default night color assignments for the system primary and secondary displays.

17.7.5 Display Color Management to Support Test

Since the ECDIS standards are still provisional, the system will permit trial of all versions contained in the IHO Provisional Standard, as well as other colors or symbols that are appropriate for testing. [2.9, page 14, paragraph 4.2.10]

17.8 Display Symbology Initialization

17.8.1 Create Symbols

ECDIS shall provide the capability to create graphic symbols, names, and text.

17.8.1.1 Create Point Symbols

ECDIS shall provide the capability to create new point symbols.

17.8.1.2 Create Line Symbols

ECDIS shall provide the capability to create new line symbols.

17.8.1.3 Create Area Symbols and Patterns

ECDIS shall provide the capability to create new area symbols and patterns.

17.8.2 Add Symbols

ECDIS shall provide the capability to add graphic symbols, names, and text to the Presentation Library.

17.8.2.1 Add Point Symbols

ECDIS shall provide the capability to add point symbols to the Presentation Library.

17.8.2.2 Add Line Symbols

ECDIS shall provide the capability to add line symbols to the Presentation Library.

17.8.2.3 Add Area Symbols and Patterns

ECDIS shall provide the capability to add area symbols and patterns to the Presentation Library.

17.8.2.4 Add Text

ECDIS shall provide the capability to add text to the Presentation Library.

17.8.3 Delete Symbols

Shall provide the operator with the capability to delete graphic symbols, names, and text from the Presentation Library.

17.8.3.1 Delete Point Symbols

ECDIS shall provide the capability to delete point symbols from the Presentation Library.

17.8.3.2 Delete Line Symbols

ECDIS shall provide the capability to delete line symbols from the Presentation Library.

17.8.3.3 Delete Area Symbols and Patterns

ECDIS shall provide the capability to delete area symbols and patterns from the Presentation Library.

17.8.3.4 Delete Text

ECDIS shall provide the capability to delete text from the Presentation Library.

17.8.4 Review Symbols and Text

ECDIS shall provide the capability to review (including attribute and symbology revision) graphic symbols, names, and text in the Presentation Library.

17.8.4.1 Review Point Symbols

ECDIS shall provide the capability to review point symbols in the Presentation Library.

17.8.4.2 Review Line Symbols

ECDIS shall provide the capability to review line symbols in the Presentation Library.

17.8.4.3 Review Area Symbols and Patterns

ECDIS shall provide the capability to review area symbols and patterns in the Presentation Library.

17.8.4.4 Review Text

ECDIS shall provide the capability to review text in the Presentation Library.

17.8.5 Symbology Correction

ECDIS shall provide the capability to interactively make final corrections to any symbolic representation of point, linear, areal, and textual data.

17.8.5.1 Edit Point Symbols

ECDIS shall provide the capability to review and revise the symbol component parameters, and delete, copy, rotate, scale and move individual point symbol components.

17.8.5.2 Edit Line Symbols

ECDIS shall provide the capability to review and revise the symbol component parameters, and delete, copy, rotate, scale and move individual line symbol components.

17.8.5.3 Edit Area Symbols and Patterns

ECDIS shall provide the capability to review and revise the symbol component parameters, and delete, copy, rotate, scale and move individual area symbol and pattern components.

17.8.6 Symbol Lookup Tables

17.8.6.1 Creation of Symbol Lookup Table Files

ECDIS shall provide the capability to create a symbol lookup table file.

17.8.6.2 Edit Symbol Lookup Tables Files

ECDIS shall provide the capability to interactively edit a symbol lookup table file.

17.9 System Help File Initialization

17.9.1 Create Help Files

ECDIS shall provide the capability to create help files.

17.9.2 Editing Help Files

ECDIS shall provide the capability to interactively edit previously generated help files.

17.10 History Collection Initialization

17.10.1 Define History File Input Content

ECDIS shall provide the capability to establish, review, and change the data content for the voyage history file.

17.10.2 Define History File Format

ECDIS shall provide the capability to establish, review, and change the history file format.

17.10.3 Define History Data Collection Rate

ECDIS shall provide the capability to establish, review, and change the history data collection rate.

17.10.4 Define History File Update Frequency

ECDIS shall provide the capability to establish, review, and change the frequency for update of the voyage history file.

18. SYSTEM BACKUP/RESTORE

18.1 General Backup/Restore Requirement

ECDIS shall provide capabilities to preserve and maintain the quality of system data in case of ECDIS failure by providing a means of backing up and restoring them from the back-up media.

18.2 System Backup Data Content

ECDIS shall provide the capability to backup all data stores and software comprising the system.

18.3 Radar Video Backup

ECDIS shall accommodate the needs of experimental recording of radar video and/or ARPA targets on at least a revolving basis, if not continuous throughout the entire voyage. [2.9, page 14, paragraph 4.2.9]

18.4 Types of System Backup/Restore

ECDIS shall provide the capability to perform the following types of backups and data restorations:

18.4.1 Full Media System Backup/Restore

ECDIS shall provide the capability to fully backup and restore all data on the system.

18.4.2 Incremental System Backup/Restore

ECDIS shall provide the capability to backup all data modified on the system since the last full backup/restore was performed.

18.4.3 Time/Date Sensitive System Backup/Restore

ECDIS shall provide the capability to back up or restore only those files which have been created or modified since an operator-specified date and time.

18.4.4 User Selected System Backup/Restore

ECDIS shall provide the capability to back up or restore only those files which have been interactively identified by the user.

18.5 System Backup Mode

ECDIS shall provide the capability to backup data in either an interactive or automatic mode.

18.6 Effect of System Backup on ECDIS Operations

ECDIS shall provide the capability to perform backup as a background operation with no adverse affect on the operation or performance of the system as a whole.

18.7 System Backup Frequency

ECDIS backups shall be scheduled in such a manner so that no more than (TBR) hours/minutes of lost data occurs in the event of system failure.

(see note 202)

18.8 Frequency of Radar Backup

Radar signal data shall be recorded for at least the previous twenty minutes before being overwritten by new data. [2.9, page 14, paragraph 4.2.9]

18.9 System Backup Media

ECDIS shall provide the capability to backup and restore utilizing any or all magnetic disk and tape hardware on the system.

19. SYSTEM ACCESS/SECURITY

19.1 System Access Security

ECDIS shall provide security measures which control access to and utilization of facilities as described in the following paragraphs:

19.1.1 User Logon Facility

ECDIS shall provide a mechanism to assure that valid user names and user passwords are supplied during logon procedures before the user may gain access to any of the system resources.

19.1.2 Logon Privileges

ECDIS shall provide the capability to authorize a user to gain access to the system and control the level of access a user has to data, programs, and system resources.

19.1.3 User ID/Password Maintenance

ECDIS shall provide a secure capability to add, delete, or modify system User ID and password information.

19.2 System Logon/Logoff Transaction Log

ECDIS shall provide the capability to maintain and manage a record of system logon/logoff transactions including the following information:

- o User ID
- o Logon/Logoff Time
- o Logon Device
- o A brief record of any equipment malfunctions observed during operation, entered at the time of logoff
- o A brief record of any software problems observed during operation, entered at the time of logoff

(see note 203)

19.2.1 Printing of Logon/Logoff Transaction Log

ECDIS shall provide the capability to print a hardcopy record of the logon/logoff transaction log at user option.

19.2.2 Maintenance Life of Logon/Logoff Transaction Log

ECDIS shall provide the capability to store the logon/logoff transaction log for a (TBR) period of time.

(see note 204)

19.3 Protection from Unauthorized or Inadvertent Access

The ECDIS operating system shall have the ability to protect all aspects of the system and application software and libraries from unauthorized or inadvertent access.

20. POWER SUPPLY (Moved from part 5, sec 7)

20.1 Primary Power Source

ECDIS shall normally be powered from the ship's main source of electrical energy. [2.1, page V, paragraph 14.1]

20.2 Alternate Power Source

It shall be possible to operate the ECDIS and all equipment necessary for its normal functioning, from an alternative source of energy. [2.1, page V, paragraph 14.1]

20.3 Changing Power Sources

ECDIS shall be designed such that changing from one source of supply to another or any interruption up to 60 s duration of the supply of electrical energy shall not require the equipment to be manually re-initialized and shall not cause information stored in the memory to be lost. [2.1, page V, paragraph 14.1]

21. MALFUNCTIONS (moved from part 5, sec 6)

21.1 Warning of System Malfunctions

ECDIS shall provide the following audible and visual warnings of system malfunctions to enable the user to monitor the proper operation of the system. [2.1, page V, paragraph 13.1]

(see note 15)

21.1.1 Startup Failures

ECDIS shall provide warning of failures encountered during internal diagnostic routines performed during startup to assure proper operation of the processor and all connected sensors. [2.18]

21.1.2 Failures During Operation

ECDIS shall provide warning of failures encountered during internal tests on the processor and sensors performed during operation of the system. [2.18]

Note: Requirements previously contained in Parts 5 and 6 were either deleted or moved to other sections of the document.

V. Document History

- A. Version 0.1 was released on 1/14/91 and provides first drafts of the sections 1,2,3 and a structural guideline for sections 4,5,6.
- B. Version 1.0 was released on February 14, 1990 and contained the first draft of ECDIS specifications for general review by interested parties.
- C. Version 1.1 was released on March 28, 1990 and incorporated initial responses and comments on Version 1.0. Version 1.1 was distributed as an interim copy to individuals closely working on the project only.
- D. Version 1.2 incorporated the decision to highlight requirements to be included in the ECDIS U.S. Testbed by showing the text of those in **bold** type. This version was not released, but was held internally for tracking purposes.
- E. Version 1.3 (Preliminary) was printed for internal purposes on April 12, 1991. All redlines marked in version 1.1 were removed and the order of Sections 10 and 11 on route monitoring and route planning was reversed.
- F. Version 1.3 was printed for tracking purposes with new redlines/strikeouts.
- G. Version 1.4 was printed on May 6, 1991 and distributed for internal review.
- H. Version 1.5 was printed on May 16, 1991 for tracking purposes with new redlines/strikeouts.
- I. Version 1.6 was printed on May 20, 1991 as a clean version for final internal edits and mark-ups.
- J. Version 1.7 was printed on May 29, 1991 for tracking purposes with new redlines/strikeouts.
- K. Version 2.0 was printed on May 31, 1991 and sent to WHOI as an Attachment to the Phase II Technical Proposal.
- L. Version 2.1 was printed on August 1, 1991 for tracking purposes with redlines. It contained edits made based on input from Rogoff and Ayres concerning closure of TBRs.
- M. Version 2.2 was printed on August 1, 1991 with redline markings removed and sent to WHOI as an Attachment to the Revised Phase II Technical Proposal.

APPENDIX A: Notes on Test-bed TBRs

Note: For this version (2.2), only notes pertaining to issues for test-bed requirements are shown. Notes previously included in this appendix have been retained in file copies for traceability purposes and for future work. These include notes for informational purposes and notes concerning TBRs for non-test-bed requirements.

1. CLOSED based on Rogoff's decision to use 70 cm for both route planning and route monitoring.
3. CLOSED by amending requirement to state that the official distribution media is 5 1/4" diskette.
5. Retained as OPEN pending identification of the means of telecommunication. Ayres states that INMARSAT-C should be considered.
6. CLOSED by amending requirement to state that Notices need to remain on board for the life of the ENC and Charts maintained on board. Assumed an average life-cycle of five years for sizing purposes.
7. Retained as OPEN pending determination of the average life-cycle of the Coast Pilot publication. Data needs to remain on board for the average life of the Coast Pilot publication.
9. CLOSED by amending requirement to state that all ad-hoc user inputs will be assumed to stay on board for a maximum of one year for sizing purposes.
15. CLOSED by adding requirements to state that internal diagnostic routines should be performed during start-up to assure proper operation of the processor and all connected sensors. Continuing internal tests on the processor and sensors should be made to assure that operation is within acceptable limits. Failure during start-up or after start should result in appropriate audible and visual warnings and alarms.
19. CLOSED by amending requirement 7.7.4 to state that the only essential grid data will be latitude and longitude. The decision on LORAN-C will be deferred to later stages of the project.
25. Retained as OPEN pending IHO input on the line feature deletion symbol. HO(C&GS) will design an ad-hoc experiment including the designation of any special symbology required for the trial. Intergraph will coordinate with C&GS to assure that the symbology used is available in Microstation.
26. Retained as OPEN pending IHO input on the area feature deletion symbol. HO(C&GS) will design an ad-hoc experiment including the designation of any special symbology required for the trial. Intergraph will coordinate with C&GS to assure that the symbology used is available in Microstation.
27. Retained as OPEN until Presentation Library is received.
28. CLOSED by amending requirement 8.16.4 to state that the grid display of latitude and longitude is essential in the test-bed. The decision on LORAN-C will be deferred to later stages of the project.

August 1, 1991

ECDIS SRS/Version 2.2

29. CLOSED by amending requirement to state that an invisible, virtual margin should exist for the true motion chart display whose sides are set back from the outer display limit 25% of the distance from outer limit to center. Once the vessel crosses this margin the chart should be reset. (Assuming a double-buffered display, or equivalent, the transition from the old chart to the new one will appear to be instantaneous.) When reset, own-ship should reappear at the margin, on the side away from its ultimate position as it moves towards the opposite margin.
30. CLOSED by amending requirement to limit the change in magnification to a step of 25% larger or smaller than the scale of charts in the database (i.e., if the base scale is 1:80,000, charts in that database should be capable of being displayed at 1:100,000, 1:80,000 and 1:60,000). Requirements were also added to allow for a variable compilation scale which can be made to conform to the radar scales of the overlaid image, within the limits of the 25% variation set for the compilation scale.
31. CLOSED by amending requirement to limit the change in magnification to a step of 25% larger or smaller than the scale of charts in the database (i.e., if the base scale is 1:80,000, charts in that database should be capable of being displayed at 1:100,000, 1:80,000 and 1:60,000). Requirements were also added to allow for a variable compilation scale which can be made to conform to the radar scales of the overlaid image, within the limits of the 25% variation set for the compilation scale.
41. Retained as OPEN because Chart 1 identification of hazards is not at the level of detail of the Object Catalog. Hence, a definitive list of special conditions based on features from the Object Catalog is still required.
42. Retained as OPEN because Chart 1 identification of hazards is not at the level of detail of the Object Catalog. Hence, a definitive list of special conditions based on features from the Object Catalog is still required.
43. Retained as OPEN because Chart 1 identification of hazards is not at the level of detail of the Object Catalog. Hence, a definitive list of special conditions based on features from the Object Catalog is still required.
44. CLOSED by amending requirement to state that cyan be used for the soundings equal to or less than the ship's draft and ivory be used for the soundings greater than the ship's draft.
45. Retained as OPEN pending customer input on definitive list of hazard conditions using SP57 (DX-90) features and attributes. Ayres stated that hazards depend on ship's draft.
54. CLOSED by amending requirement to eliminate wheel-over points and the display of planned radii which connect tracks on different courses.
68. Retained as OPEN pending consultation with WHOI on maximum collection interval.
- 72-76. CLOSED based on comments by Ayres and Rogoff. Rogoff commented that since the ECDIS user is never called upon to make measurements on the surface of his display, the requirements of sections 13.2.8 through 13.2.12 should be ignored. Intergraph

intends to leave these calculations as non-test-bed requirements and further notes that these were requirements of the IMO Provisional Standard.

- 78. CLOSED by statement from Rogoff that the list is complete.
- 79. CLOSED by statement from Rogoff that the list is complete.
- 80. CLOSED by statement from Rogoff that the list is complete.
- 81. Retained as OPEN based on Rogoff's comment in response to 81 and 82. He stated that the information required refers to the contents to be supplied in two index maps. This is a matter that can be best accomplished during the construction of application programs, once the exact details of the available data sets are known. The criteria for inclusion or exclusion in the index should be: the ability to reconstruct a data file for use by the SENC from the larger database installed in the on-board computer.
- 90. CLOSED. Intergraph will choose the number of critical commands for test-bed design purposes.
- 95. CLOSED by amending requirement to state that the only interference will be a flashing note "updating-in-progress."
- 96. CLOSED by deleting requirement. Coast Pilots will not be provided in SP57 (DX-90).
- 97. CLOSED by amending requirement to state that Coast Pilots will be provided in ASCII format.
- 106. NOTE: Items marked by an asterisk were added at the request of reviewers.
- 107. CLOSED by agreement to leave as written: indicator will show when the vessel is in a restricted or prohibited area.
- 108. CLOSED by a) assuming that "features for safe navigation" refers to all those shown on the default display, and b) amending requirement to state that contents of cautionary notes are to be shown on the default primary screen display. Note that the terminology "features for safe navigation" will be revised in the updated version of the IMO Standard.
- 109. NOTE: Items marked by an asterisk were added at the request of reviewers.
- 110. CLOSED by agreement to leave units of measure as written.
- 114. CLOSED by assumption that a specific list of items, presently shown in the title block, to be shown in the legend is included in SP57 (DX-90).
- 117. CLOSED by agreement to leave as written: indicator will show when the vessel is in a restricted or prohibited area.
- 118. CLOSED by assuming that if there is a legal requirement to use a datum other than WGS-84, a signal will be found in the database supporting the particular chart. Requirement amended to clarify use of a different datum.

120. CLOSED. Values from the Tidal Current Tables will be used for the test-bed.
121. CLOSED by agreement to leave as written: official HO-ENC database information is removable.
124. Retained as OPEN pending customer on other data.
136. CLOSED. Intergraph will presume frequently needed controls for test-bed design purposes.
138. Retained as OPEN pending receipt of IHO Presentation Library which contains simplified symbols for the nature of the seabed.
140. CLOSED by amending requirement to state that the length of course vector is six minutes and the speed vector is two minutes.
141. Retained as OPEN pending customer input of a list of minimum display items.
142. CLOSED by amending requirement to add the phrase "the scale at which the data is furnished."
143. CLOSED by amending requirement to state that default display must be accessible at any time in accordance with the IMO/IHO requirement.
145. CLOSED by agreement to leave requirement as written regarding "water track."
146. CLOSED by agreement that Intergraph will choose a hull-shaped or arrowhead symbol to represent the ship at implementation.
147. CLOSED by agreement to leave requirement as written: the radar video images and the ARPA information will be both shown in green.
153. Retained as OPEN pending consultation with WHOI on vessel position collection interval. Ayres commented that the collection interval depends upon traffic and area-- 1 hour in mid-ocean, 1 minute in harbor approach. Rogoff commented that vessel position collection interval should be commensurate with the rotation of the radar antenna. Typically, the radar image is completely updated in two to two-and-a-half seconds, which results in a movement of the entire radar overlay in that amount of time. Own-ship position should be updated in no more than that interval of time in order to maintain relative positions with radar targets.
164. CLOSED by amending requirement to state that the default scale for any display is the largest scale chart containing the position of own-ship. Other scales, also containing the vessel should be available at the option of the user (hence they are simultaneously available, but only one chart of one scale is on view at one time). If windows are used, this arrangement can be modified, but the scale of the default chart on display remains the same.
170. Retained as OPEN pending guidance from WHOI on the default distance which will initiate a warning when the ship goes off track. Ayres commented that the default distance must be 500 yards or more or less depending on area. Rogoff commented that a default off-track alarm distance shall be established as +/-five feet (the approximate

nominal expected error of Differential GPS positions). In addition, the user should have the option to interactively change this tolerance at any point along a planned route.

194. CLOSED by amending requirement to state that the official distribution media is 5 1/4" diskette.
196. CLOSED by agreement that this value will be established during ECDIS software testing and validation on M/V EAGLE MAR.
197. Retained as OPEN pending receipt of definitive list in IEC 872 Appendix E, "ARPA Video Symbols and Control Names," IEC Geneva, 1989.
198. Retained as OPEN pending customer input on definitive list of special conditions based on features from the Object Catalog. However, Intergraph amended the requirement to add the wording in section 11.16.2: Time and distance to a place for which special conditions exist.
199. CLOSED by direction from Rogoff to drop "Other" as a test-bed requirement.
200. CLOSED by amending requirement to state that the internal hardware clock should be capable of maintaining time accuracy to a tolerance of one minute per week. Provision has been made for continuous display of clock time. Requirement added to allow for simple re-setting of the clock when required.
201. Retained as OPEN pending customer input on section 16 regarding format and types of data to be input/output, and standards for interfacing. These will need to be resolved, at least for the test-bed requirements, before Intergraph can implement this functionality.
202. Retained as OPEN pending customer input during implementation.
203. CLOSED by amending requirement to add the following in section 19.2:
 - o A brief record of any equipment malfunctions observed during operation, entered at the time of logoff.
 - o A brief record of any software problems observed during operation, entered at the time of logoff.
204. Retained as OPEN pending implementation. Intergraph will fill in values based on current hardware.
205. Retained as OPEN. Ayres stated tide datum will not change enough to be a problem; it is reflected in the depths shown. However, a decision is still needed regarding what constitutes "official tidal information" for the test-bed. (See note 210.)
206. CLOSED by amending requirement to state that height-of-tide information will be interactively entered by the mariner, based on tables provided by the HO.
207. CLOSED by Ayres. Datum will be given for area by the HO. Quality indicator refers to the quality of the data and will also be given by the HO. Intergraph assumes these values will be provided as part of the ENC.

208. Retained as OPEN pending clarification of this requirement because the references are not definitive on how interactive updates should be displayed relative to official HO-data. Guidance for how to display for the test-bed is needed. Ayres commented that interactive updates should be both overlay and (if HO NTM) integrated for test.
209. Retained as OPEN pending explanation of the term "overscale or overscale in percentage."
210. Retained as OPEN pending identification of navigation publication data to be included in the test-bed. Requirements regarding management of the following publications are found in Section 4:
1. Radio Navigational Aids Publication 117
 2. Tidal Current Tables
 3. Tidal Current Charts
 4. Tidal Current Diagrams
 5. Tide Tables
 6. Current Diagrams
211. Retained as OPEN pending guidance on the number of data sets to be maintained separately. Throughout the references mention is made of maintaining separate data sets for HO-data, SENC data, automatic updates, interactive updates, etc. The references are not in agreement, however, and the number of data sets is not clear.
212. Retained as OPEN pending activity by the IHO COE to review recommendations for changes proposed by member countries in Monaco in March 1991.
214. CLOSED by deleting requirement 8.1.9. (Requirements 8.1.9 and 8.1.10 are in conflict.) This is based on comment by Ayres that requirement 8.1.9 is invalid.
215. NOTE: ECDIS displays will reproduce the content equivalent to paper charts to extent possible using electronic graphics technology.

APPENDIX B: Requirements Index

1.1 ENC Loading	8
1.1.1 Input from Distribution Media	8
1.1.2 Use of IHO DX-90 Exchange Standard	8
1.1.3 Feature/Attribute Data Loading	8
1.1.4 ENC Data Dictionary Loading	8
1.1.5 Meta-Data Loading	8
1.1.6 Verification Mechanism	8
1.1.6.1 Load Verification	8
1.1.6.2 Display Verification	8
1.1.7 Validation of Translations	8
1.1.8 Maintenance of ENC Access	9
1.1.9 Conformance of ENC to HO Standard	9
1.2 Use of IHO Cell Structure	9
1.2.1 Use of IHO Cell Numbering System	9
1.2.2 Maintenance of IHO Cell Characteristics	9
1.3 ENC Coordinate System	9
1.4 ENC Horizontal Datum	9
1.5 ENC Vertical Datum	10
1.6 (deleted)	10
1.6.1 (requirement combined with requirement 1.1.7)	10
1.6.2 (requirement moved to 1.1.9)	10
1.7 ENC Accuracy	10
2.1 Type of Updates	11
2.2 Source of Updates	11
2.3 Mode of Update	11
2.3.1 Automatic Update Processing	11
2.3.1.1 Format of NTM Correction Files	11
2.3.1.1.1 Translation Verification	11
2.3.1.2 Integration of Digital Updates	11
2.3.1.3 Automatic Application of Digital Updates	11
2.3.1.4 Application of Digital Updates to the SENC Display	11
2.3.1.5 Timing of Automatic Updates	12
2.3.1.5.1 Default Time of Application for Automatic Updates	12
2.3.1.6 (deleted)	12
2.3.2 Interactive Update Processing	12
2.3.2.1 Application of Updates Interactively	12
2.3.2.2 Interactive Update Overlay	12
2.3.2.2.1 (Combined with 2.3.2.2)	12
2.3.2.3 Verification of Interactive Updates	12
2.3.2.4 Interactive Update User Interface	12
2.3.2.5 (moved to 3.8.6)	12
2.3.2.6 Storage of Interactive Updates	12
2.4 Update Distribution Media	12
2.4.1 HO Distribution Media	13
2.4.2 Hardcopy	13
2.4.3 Cassette or Diskette	13
2.4.4 Telecommunications	13
3.1 ENC Update Categories	14
3.1.1 Standard Notice to Mariners (NTMs)	14
3.1.2 Preliminary/Passive NTMs	14

3.1.3 Temporary NTM's	14
3.1.4 Chartlets	14
3.2 ENC Update Types	14
3.2.1 Feature Updates	14
3.2.1.1 Point Feature Updates	14
3.2.1.1.1 Add Point Feature	14
3.2.1.1.2 Delete Point Feature	14
3.2.1.1.3 Replace Point Feature	15
3.2.1.1.4 Modify Point Feature	15
3.2.1.2 Line Feature Updates	15
3.2.1.2.1 Add Line Feature	15
3.2.1.2.2 Delete Line Feature	15
3.2.1.2.3 Replace Line Feature	15
3.2.1.2.4 Modify Line Feature	15
3.2.1.3 Area Feature Updates	15
3.2.1.3.1 Add Area Feature	15
3.2.1.3.2 Delete Area Feature	15
3.2.1.3.3 Replace Area Feature	15
3.2.1.3.4 Modify Area Feature	15
3.2.1.4 Attribute Data Updates	16
3.2.1.4.1 Point Feature Attributes	16
3.2.1.4.1.1 Add Point Feature Attributes	16
3.2.1.4.1.2 Delete Point Feature Attributes	16
3.2.1.4.1.3 Replace Point Feature Attributes	16
3.2.1.4.1.4 Modify Point Feature Attributes	16
3.2.1.4.2 Line Feature Attributes	16
3.2.1.4.2.1 Add Line Feature Attributes	16
3.2.1.4.2.2 Delete Line Feature Attributes	16
3.2.1.4.2.3 Replace Line Feature Attributes	16
3.2.1.4.2.4 Modify Line Feature Attributes	16
3.2.1.4.3 Area Feature Attributes	16
3.2.1.4.3.1 Add Area Feature Attributes	16
3.2.1.4.3.2 Delete Area Feature Attributes	16
3.2.1.4.3.3 Replace Area Feature Attributes	17
3.2.1.4.3.4 Modify Area Feature Attributes	17
3.2.2 ENC Area Updates	17
3.2.3 Temporary Updates (requirement combined with requirement 3.1.3)	17
3.3 Access to ENC Data for Update	17
3.4 ENC Integrity Maintenance	17
3.4.1 Update Integrity Checking	17
3.4.2 Accuracy Preservation	17
3.4.2.1 Precision	17
3.4.2.2 Information Content	17
3.4.3 Conformance to Standards	17
3.4.4 ENC Security	18
3.5 Update Data Maintenance	18
3.5.1 Maintenance of ENC Change Data Sets	18
3.5.2 Update Maintenance Life	18
3.6 Update Identification Checking	18
3.7 Update Conversions, Adjustments, Translations	18
3.7.1 Update Conversions	18
3.7.1.1 Update Coordinate Conversion	18

3.7.1.2 Update Unit Conversion	18
3.7.1.3 (deleted due to duplication of requirement 3.7.3.2)	18
3.7.2 Update Adjustments	19
3.7.2.1 Update Horizontal Datum Adjustment	19
3.7.2.2 Update Horizontal Datum Adjustment Verification	19
3.7.2.3 (deleted due to statement of non-requirement)	19
3.7.3 Update Translation (deleted)	19
3.7.3.1 DX-90 Translation (requirement combined with requirement 2.3.1.1)	19
3.7.3.2 Translation Verification (requirement moved to 2.3.1.1.1)	19
3.8 Update Recording	19
3.8.1 Update Record File	19
3.8.2 Update Record Content	19
3.8.3 Update Record Sorting	19
3.8.4 Update Record Maintenance Life	20
3.8.5 (combined with 3.8.2)	20
3.8.6 Interactive Update Transaction Logging (moved from 2.3.2.5)	20
3.9 Update Reporting	20
3.9.1 User Notification	20
3.9.2 ENC Display Update Reports	20
3.9.3 Hardcopy Update Reports	20
3.10 Affect of ENC Update on ECDIS Operations	21
3.11 ENC Update Volume	21
3.12.1 Amplifying Text Data Processing	21
3.12.2 Amplifying Text Data Loading	21
3.12.3 Amplifying Text Note Maintenance	21
3.12.4 Amplifying Text Note Recording	21
3.12.5 Amplifying Text Note Reporting	21
3.13 Use of Paper Chart Update Information	21
3.13.1 Processing of Paper Chart NTM Data	21
3.13.1.1 Processing of Textual Paper Chart NTM Data	22
3.13.1.2 Processing of Graphic NTM Data	22
3.13.2 Paper Chart NTM Data Loading	22
3.13.2.1 Load Textual and Graphic Paper Chart NTM Data in DX-90 Format	22
3.13.2.2 Load Textual Paper Chart NTM Data in ASCII Format	22
3.13.3 Correlation of Paper Chart NTM Data to ENC Cells	22
3.13.4 Printing of Textual Paper Chart NTM Data	22
3.13.5 Maintenance Life of Paper Chart NTM Data	22
4.1 General Notice Management	24
4.1.1 General Notice Processing	24
4.1.2 General Notice Loading	24
4.1.3 Linkage of General Notice Data	24
4.1.4 Printing of General Notice Data	24
4.1.5 Maintenance Life of General Notice Data	24
4.2 Coast Pilot Data Management	24
4.2.1 Coast Pilot Data Processing	24
4.2.2 Coast Pilot Data Loading	24
4.2.2.1 (deleted)	25
4.2.2.2 Coast Pilot Data in ASCII Format	25
4.2.3 Linkage of Coast Pilot Data	25
4.2.4 Printing of Coast Pilot Data	25
4.2.5 Maintenance Life of Coast Pilot Data	25
4.3 Light List Data Management	25

4.3.1 Processing of Light List Data	25
4.3.2 Light List Data Loading	25
4.3.2.1 Light List Data in DX-90 Format	25
4.3.2.2 Light List Data in ASCII Format	25
4.3.3 Linkage of Light List Data	26
4.3.4 Printing of Light List Data	26
4.3.5 Maintenance Life of Light List Data	26
4.4 (entire section moved to 3.13).	26
4.5 Ad-hoc User Data	26
4.5.1 Graphical Ad-Hoc User Data	26
4.5.1.1 Add Point Data	26
4.5.1.2 Remove Point Data	26
4.5.1.3 Modify Point Data	26
4.5.1.4 Add Line Data	26
4.5.1.5 Remove Line Data	26
4.5.1.6 Modify Line Data	27
4.5.1.7 Add Area Data	27
4.5.1.8 Remove Area Data	27
4.5.1.9 Modify Area Data	27
4.5.2 Input Textual Ad-Hoc User Data	27
4.5.3 Linkage of Textual Ad-Hoc User Data	27
4.5.4 Printing of Ad-Hoc User Data	27
4.5.5 Maintenance Life of Ad-Hoc User Data	27
4.6 Radio Navigational Aids Publication 117 Data Management	27
4.6.1 Processing of Radio Navigational Aids Publication 117 Data	27
4.6.2 Radio Navigational Aids Publication 117 Data Loading	27
4.6.2.1 Radio Navigational Aids Publication 117 Data in DX-90 Format	27
4.6.2.2 Radio Navigational Aids Publication 117 Data in ASCII Format	28
4.6.3 Linkage of Radio Navigational Aids Publication 117 Data	28
4.6.4 Printing of Radio Navigational Aids Publication 117 Data	28
4.6.5 Maintenance Life of Radio Navigational Aids Publication 117 Data	28
4.7 Tidal Current Tables Data Management	28
4.7.1 Processing of Tidal Current Tables Data	28
4.7.2 Tidal Current Tables Data Loading	28
4.7.2.1 Tidal Current Tables Data in DX-90 Format	28
4.7.2.2 Tidal Current Tables Data in ASCII Format	28
4.7.3 Linkage of Tidal Current Tables Data	29
4.7.4 Printing of Tidal Current Tables Data	29
4.7.5 Maintenance Life of Tidal Current Tables Data	29
4.8 Tidal Current Charts Data Management	29
4.8.1 Processing of Tidal Current Charts Data	29
4.8.2 Tidal Current Charts Data Loading	29
4.8.2.1 Tidal Current Charts Data in DX-90 Format	29
4.8.2.2 Tidal Current Charts Data in ASCII Format	29
4.8.3 Linkage of Tidal Current Charts Data	29
4.8.4 Printing of Tidal Current Charts Data	29
4.8.5 Maintenance Life of Tidal Current Charts Data	30
4.9 Tidal Current Diagrams Data Management	30
4.9.1 Processing of Tidal Current Diagrams Data	30
4.9.2 Tidal Current Diagrams Data Loading	30
4.9.2.1 Tidal Current Diagrams Data in DX-90 Format	30
4.9.2.2 Tidal Current Diagrams Data in ASCII Format	30

4.9.3 Linkage of Tidal Current Diagrams Data	30
4.9.4 Printing of Tidal Current Diagrams Data	30
4.9.5 Maintenance Life of Tidal Current Diagrams Data	30
4.10 Tide Tables Data Management	31
4.10.1 Processing of Tide Tables Data	31
4.10.2 Tide Tables Data Loading	31
4.10.2.1 Tide Tables Data in DX-90 Format	31
4.10.2.2 Tide Tables Data in ASCII Format	31
4.10.3 Linkage of Tide Tables Data	31
4.10.4 Printing of Tide Tables Data	31
4.10.5 Maintenance Life of Tide Tables Data	31
4.11 Current Diagrams Data Management	31
4.11.1 Processing of Current Diagrams Data	31
4.11.2 Current Diagrams Data Loading	32
4.11.2.1 Current Diagrams Data in DX-90 Format	32
4.11.2.2 Current Diagrams Data in ASCII Format	32
4.11.3 Linkage of Current Diagrams Data	32
4.11.4 Printing of Current Diagrams Data	32
4.11.5 Maintenance Life of Current Diagrams Data	32
5.1 Navigation Publications Data Update Sources	33
5.2 Use of Paper Chart Update Information	33
5.3 Navigation Publications Data Update Types	33
5.3.1 Navigation Publications Data Record Updates	33
5.3.2 Publication Updates	33
5.4 Navigation Publications Data Update Distribution Media	33
5.4.1 HO Distribution Media	34
5.4.2 Hardcopy	34
5.4.3 Cassette or Diskette	34
5.4.4 Telecommunications (TBR)	34
5.5 Automatic Update Processing (TBR)	34
5.5.1 Automatic Processing of Navigation Publications Data (TBR)	34
5.5.2 Automatic Update Integration (TBR)	34
5.5.3 (deleted)	34
5.6 Interactive Update Processing	34
5.6.1 Application of Updates Interactively	34
5.6.2 Interactive Update Integration	34
5.6.3 Verification of Interactive Updates	34
5.6.4 User Interface for Navigation Publications Data Update	35
5.6.5 (moved to 5.11)	35
5.7 Update Data Maintenance	35
5.7.1 Maintenance of Navigation Publications Change Data Sets	35
5.7.2 Update Maintenance Life for Navigation Publications Data	35
5.8 Navigation Publications Update Conversions, Adjustments, Translations	35
5.8.1 Navigation Publications Update Conversions	35
5.8.2 Navigation Publications Update Coordinate Transformations	35
5.8.3 Navigation Publications Update Datum Transformations	35
5.9 Navigation Publication Update Recording	35
5.9.1 Navigation Publication Update Record File	35
5.9.2 Navigation Publications Update Record Content	36
5.9.3 Non-ENC Update Record Sorting	36
5.9.4 Update Record Maintenance Life	36
5.9.4.1 Light List Record Maintenance Life	36

5.9.4.2 Coast Pilot Record Maintenance Life	36
5.9.4.3 Paper Chart NTM Data Maintenance Life	36
5.9.4.4 General NTM Data Maintenance Life	37
5.9.4.5 Radio Navigational Aids Publication 117 Maintenance Life	37
5.9.4.6 Tidal Current Tables Record Maintenance Life	37
5.9.4.7 Tidal Current Charts Record Maintenance Life	37
5.9.4.8 Tidal Current Diagrams Record Maintenance Life	37
5.9.4.9 Tide Tables Record Maintenance Life	37
5.9.4.10 Current Diagrams Record Maintenance Life	37
5.10 Navigation Publications Data Update Reporting	37
5.11 Navigation Publications Data Update Transaction Logging	37
5.12 Affect of Navigation Publication Update on ECDIS Operations	38
6.1 Radio Navigational Warnings	39
6.1.1 Radio Navigational Warning Processing	39
6.1.2 Linkage of Radio Navigational Warning Data	39
6.1.3 Radio Navigational Warnings Retention	39
6.2 NAVAREA Updates	39
6.2.1 NAVAREA Processing	39
6.2.2 Linkage of NAVAREA Data	39
6.2.3 NAVAREA Update Retention	39
6.3. NAVTEX Updates	39
6.3.1 NAVTEX Processing	39
6.3.2 Linkage of NAVTEX Warning Data	40
6.3.3 NAVTEX Update Retention	40
7.1 SENC Generation Frequency	41
7.2 Generation of SENC from multiple data sets	41
7.3 SENC Projection	41
7.3.1 Mercator Projection	41
7.3.2 Secondary Projections	41
7.3.3 Default Projection Scale Parallel	41
7.3.4 Definition of Projection Scale Parallel	41
7.3.5 Chart Projection to Support Radar	41
7.3.5.1 Default Projection for Radar Overlay	41
7.3.5.2 Azimuthal Equidistant Projection	41
7.3.5.2.1 Changing to Azimuthal Equidistant Projection	42
7.4 SENC Symbolization	42
7.4.1 Use of IHO Symbols and Colors	42
7.5 ENC Generalization	42
7.6 (deleted)	42
7.6.1 (moved to 2.5)	42
7.6.2 (moved to 2.5)	42
7.7 Generation of Derived Graphics	42
7.7.1 Generation of Scale Bar	42
7.7.2 Generation of Latitude Bar	42
7.7.3 Graticule Generation	42
7.7.4 Grid Generation	42
7.7.5 Magnetic Compass Rose Generation	42
7.7.6 True Compass Rose Generation	43
7.8 Adjustment of ENC Depth Data	43
7.9 (moved to 13.11)	43
8.1 General Display Requirements	44
8.1.1 Display Components	44

<u>8.1.2 Feature Display</u>	44
<u>8.1.3 Display of Data from Different Sources</u>	44
<u>8.1.4 Default SENC Display Scale</u>	44
<u>8.1.5 (deleted due to subjectivity)</u>	45
<u>8.1.6 Level of Chart Display Detail</u>	45
<u>8.1.7 Effective Size of SENC Chart Display (moved from part 5, 1.2)</u>	45
<u>8.1.8 Display Visibility (moved from part 5, 1.3)</u>	45
<u>8.1.9 (deleted)</u>	45
<u>8.1.10 SENC Refresh Rate 2 (moved from part 5, 1.6)</u>	45
<u>8.1.11 Similarity of SENC Display to Paper Chart (moved from part 5, 1.8)</u>	45
<u>8.1.12 Primary, Secondary, and Auxiliary Displays</u>	45
<u>8.1.12.1 Primary Display (moved from part 5, 1.10.1)</u>	45
<u>8.1.12.2 Secondary Display (moved from part 5, 1.10.2)</u>	45
<u>8.1.12.3 Quality of Secondary Display (moved from part 5, 1.10.3)</u>	45
<u>8.1.12.4 Alphanumeric Display (moved from part 5, 1.10.4)</u>	46
<u>8.1.12.4.1 Type Style</u>	46
<u>8.1.12.4.2 Alphanumeric Window on Graphic Display</u>	46
<u>8.1.12.4.3 Fonts (moved from 8.14.4)</u>	46
<u>8.1.12.5 Primary and Secondary Display Capabilities (moved from part 5, 1.10.5)</u>	46
<u>8.1.12.6 Single Display Screen System Configuration (moved from part 5, sec 1.14)</u>	46
<u>8.1.12.7 Display Interchangability (moved from part 5, 1.9)</u>	46
<u>8.2 Display Content</u>	46
<u>8.2.1 ECDIS Default Display</u>	46
<u>8.2.1.1 Default Display on the Primary Screen</u>	47
<u>8.2.1.2 Default Display on the Secondary Screen</u>	48
<u>8.2.2 On-Demand Displays</u>	48
<u>8.2.2.1 On-Demand Primary Display</u>	49
<u>8.2.2.2 On-Demand Secondary Display</u>	49
<u>8.2.3 Minimum Display Content</u>	49
<u>8.3 Default Display Access</u>	49
<u>8.3.1 Single Action Access of Default Display</u>	49
<u>8.3.2 Continual Access of Default Display</u>	50
<u>8.4 Default Display Warning</u>	50
<u>8.5 Display Priorities</u>	50
<u>8.5.1 Priority 1 Display Data</u>	50
<u>8.5.2 Priority 2 Display Data</u>	50
<u>8.5.3 Priority 3 Display Data</u>	50
<u>8.5.4 Priority 4 Display Data</u>	50
<u>8.5.5 Priority 5 Display Data</u>	50
<u>8.5.6 Priority 6 Display Data</u>	50
<u>8.5.7 Priority 7 Display Data</u>	50
<u>8.5.8 Priority 8 Display Data</u>	51
<u>8.5.9 Priority 9 Display Data</u>	51
<u>8.5.10 Priority 10 Display Data</u>	51
<u>8.5.11 Priority 11 Display Data</u>	51
<u>8.5.12 Default Display Priority Data</u>	51
<u>8.5.13 Relationship of Priority Data</u>	51
<u>8.5.14 Priority of non-HO Information Display</u>	51
<u>8.5.15 Priority of Information Relative to Ship's Position</u>	51
<u>8.5.16 Danger Area Display Priority</u>	51
<u>8.5.17 Area Feature Display Priority</u>	52
<u>8.6 Display Units</u>	52

8.6.1 (deleted due to subjectivity)	52
8.6.2 Position Display Units	52
8.6.3 Default Depth Display Units	52
8.6.4 Auxiliary Depth Display Units	52
8.6.5 Height Display Units	52
8.6.6 Distance Display Units	52
8.6.7 Speed Display Units	52
8.7 Display Orientation	52
8.7.1 North-up Display of ENC Data	52
8.7.2 Default Orientation	53
8.7.3 Course-up Display Orientation	53
8.7.4 Generation of Course-up Display	53
8.7.5 Course-up Display Alteration	53
8.7.5.1 Interactive Course-up Display Alteration	53
8.7.5.2 Automatic Course-up Display Alteration	53
8.7.5.2.1 Automatic Course Alteration Defaults	53
8.7.5.2.2 User Definition of Course Alteration Default	53
8.7.5.2.3 Display of Course Alteration Default	53
8.7.6 Indication of North Direction on Course-Up Display	53
8.7.7 Orientation of Symbols on Course-up Display	54
8.7.8 (deleted due to duplication by 8.7.5)	54
8.8 Use of Alphabets and Languages	54
8.8.1 Display Language	54
8.8.2 Geographic Names Display Language	54
8.9 Display Legend	54
8.9.1 General Requirements	54
8.9.2 Legend Depth Display	54
8.10 Display of Multiple Scale Areas	55
8.11 EC Feature Attribute Display	55
8.12 (deleted due to duplication by previous requirements)	55
8.12.1 Feature-Related Text Display	55
8.13 Display of Lines and Symbols	55
8.13.1 General Requirements	55
8.13.1.1 (moved to 2.6.2.1)	55
8.13.1.1 Symbol Angularity (moved from part 5, 1.13.1)	55
8.13.1.2 Angular Error of Line Symbols (moved from part 5, 1.13.2)	55
8.13.1.3 Complex Symbol Size (moved from part 5, 1.13.3)	55
8.13.1.4 Simple Symbol Size (moved from part 5, 1.13.4)	55
8.13.1.5 Line Thickness Determination (moved from part 5, 1.13.5)	56
8.13.1.6 Viewing Distance (moved from part 5, 1.12)	56
8.13.1.6.1 Operational Viewing Distance for Route Planning (moved from part 5, 1.12.1)	56
8.13.1.6.2 Operational Viewing Distance for Route Monitoring (moved from part 5, 1.12.2)	56
8.13.1.6.3 Operational Viewing Distance for Text	56
8.13.2 Symbol Types	56
8.13.2.1 Simplified Generic Symbols	56
8.13.2.1.1 Simplified Buoy and Beacon Symbols	57
8.13.2.1.1.1 Simplified Beacon Symbol	57
8.13.2.1.1.2 Simplified Buoy Symbols (Non-cardinal)	57
8.13.2.1.1.3 Simplified Buoy and Beacon Symbols (Cardinal)	57
8.13.2.1.1.4 Display of Buoys	57
8.13.2.1.1.5 Description of Buoys and Beacons Command	57
8.13.2.1.1.6 Display of Buoy and Beacon Characteristics (Option 1)	57

8.13.2.1.1.7 Display of Buoy and Beacon Characteristics (Option 2)	57
8.13.2.1.1.8 Display of Buoy and Beacon Characteristics (Option 3)	57
8.13.2.1.1.9 Display of Buoy and Beacon Characteristics (Option 4)	58
8.13.2.1.1.10 Display of Buoy and Beacon Characteristics (Option 5)	58
8.13.2.1.1.11 Display of Buoy and Beacon Characteristics (Option 6)	58
8.13.2.1.1.12 Display of Buoy and Beacon Characteristics (Option 7)	58
8.13.2.1.1.13 Display of Buoy and Beacon Characteristics (Option 8)	58
8.13.2.1.1.14 Display of All Buoy and Beacon Characteristics	58
8.13.2.1.1.15 Display of Individual Buoy and Beacon Characteristics	58
8.13.2.1.2 Display of Lights	58
8.13.2.1.2.1 Automatic Addition of Light Flares	58
8.13.2.1.2.2 Interactive Addition of Light Flares	59
8.13.2.1.2.3 Display of Light Flares and Characteristics	59
8.13.2.1.2.3.1 Information on Individual Lights	59
8.13.2.1.2.4 Display of Light Sectors (Option 1)	59
8.13.2.1.2.5 Display of Light Sectors (Option 2)	59
8.13.2.1.2.5.1 Location of Display of Light Sectors (Option 2)	59
8.13.2.1.2.6 Display of Light Sectors (Option 3)	59
8.13.2.1.2.7 Display of Light Sectors (Option 4)	59
8.13.2.1.3 Isolated Underwater Danger	59
8.13.2.1.4 Dredged Channel	60
8.13.2.1.5 Coastline	60
8.13.2.2 New ECDIS Symbols	60
8.13.2.2.1 Indication of Caution Symbol	60
8.13.2.2.2 Information Available Symbol	60
8.13.2.2.3 Scale Boundary	60
8.13.2.2.4 Overscale	60
8.13.2.2.5 North Arrow	60
8.13.2.2.6 Ramark, Racon	61
8.13.2.2.7 Chart Cursor	61
8.13.2.3 Symbols Used for Navigational Routines	61
8.13.2.3.1 Specifications for Navigation Lines and Symbols	62
8.13.2.4 ARPA symbols	62
8.13.2.5 ECDIS INT1 Symbols	62
8.13.2.5.1 Use of IHO INT1 Section IA (Chart number, Title, Marginal Notes)	62
8.13.2.5.2 (deleted due to duplication by requirement 14.3.1.1)	62
8.13.2.5.3 Tides and Currents	63
8.13.2.5.3.1 Tidal Level Diagram	63
8.13.2.5.3.2 Tidal Stream Symbol and Table	63
8.13.2.5.3.3 Display of Tidal Information	63
8.13.2.5.3.4 Display of Current Information	63
8.13.2.5.4 (moved to 8.13.2.5.3.2)	63
8.13.2.5.5 Depth Shading for Route Planning	63
8.13.2.5.5.1 Depth Shades for Route Monitoring	63
8.13.2.5.6 Contours and Soundings	63
8.13.2.5.7 Use of IHO Section IJ (Nature of the Seabed)	64
8.13.2.5.8 Rocks, Wrecks, Obstructions	64
8.13.2.5.9 Offshore Installations	64
8.13.2.5.10 Use of IHO Section IM (Tracks, Routes)	64
8.13.2.5.10.1 Traffic Separation Zones	64
8.13.2.5.11 Leading Lines	64
8.13.2.5.12 Fog Signals	64

<u>8.13.2.5.13 Radar and Radio Stations</u>	64
<u>8.13.2.5.14 Display of Electronic Positioning System Lattices</u>	65
<u>8.13.2.5.15 Pilot Services</u>	65
<u>8.13.2.5.16 Small Craft Facilities</u>	65
8.13.3 (deleted due to subjectivity)	65
<u>8.13.4 Symbol and Character Size at Specified Scales</u>	65
<u>8.13.5 Feature Labels</u>	65
<u>8.13.6 Feature Deletion Symbolology</u>	65
<u>8.13.6.1 Point Feature Deletion Symbolology</u>	65
<u>8.13.6.2 Line Feature Deletion Symbolology</u>	65
<u>8.13.6.3 Area Feature Deletion Symbolology</u>	65
<u>8.13.7 Feature Addition Symbolology</u>	65
<u>8.13.7.1 Point Feature Addition Symbolology</u>	66
<u>8.13.7.2 Line Feature Addition Symbolology</u>	66
<u>8.13.7.3 Area Feature Addition Symbolology</u>	66
<u>8.14 Display Portrayal</u>	66
8.14.1 (deleted due to duplication)	66
8.14.2 (deleted due to duplication)	66
<u>8.14.3 Alphanumeric Characters</u>	66
8.14.4 (moved to 8.1.12.4.3)	66
<u>8.14.5 Own-Ship Contour Display</u>	66
8.14.6 (deleted due to duplication by requirement 8.13.2.1.1.4)	66
<u>8.14.7 Own-Ship and Associated Symbols</u>	67
<u>8.14.7.1 Hull-Shaped Ship Symbol</u>	67
<u>8.14.7.2 Scale of Ship Symbol</u>	67
<u>8.14.7.3 Past Track Data</u>	67
<u>8.14.7.4 Course and Speed Vectors</u>	67
8.14.8 (renumbered)	67
8.14.9 (renumbered)	67
8.14.10 (renumbered)	67
<u>8.14.11 Navigator's Chartwork</u>	67
<u>8.14.11.1 Planned Route and Associated Notations</u>	67
<u>8.14.11.2 Miscellaneous Navigator's Chartwork and Notations</u>	67
8.14.12 (replaced by 8.14.11.2)	68
8.14.13 (replaced by 8.14.11.2)	68
8.14.14 (replaced by 8.14.11.2)	68
<u>8.14.15 Radar Information</u>	68
<u>8.14.15.1 ARPA</u>	68
<u>8.14.15.2 Radar Video (moved from 8.15.6.1)</u>	68
<u>8.14.16 Manufacturer's Information</u>	68
<u>8.14.16.1 Manufacturer's Information - Points & Lines</u>	68
<u>8.14.16.2 Manufacturer's Information - Areas</u>	68
<u>8.15 Application of Shades and Patterns</u>	68
<u>8.15.1 General Requirement for Shading</u>	68
<u>8.15.2 General Requirement for Patterning</u>	69
8.15.3 (deleted)	69
8.15.4 (deleted)	69
8.15.5 (deleted)	69
8.15.5.1 (deleted due to duplication by requirement 8.13.2.5.5)	69
8.15.5.2 (deleted due to duplication by requirement 8.13.2.5.5)	69
8.15.5.3 (moved to requirement 8.13.2.5.10.1)	69
8.15.5.4 (requirement combined with requirement 8.13.2.2.4)	69

8.15.5.5 (moved to 8.15.6.2)	69
8.15.6 (deleted)	69
8.15.6.1 (moved to 8.14.15.2)	69
8.15.6.2 <u>Danger Areas</u>	69
8.15.6.3 (deleted due to duplication by previous requirements)	69
8.15.6.4 (moved to 8.14.16.2)	69
8.15.7 <u>General Use Shading</u>	69
8.15.8 <u>General Use Patterning</u>	70
8.15.9 (deleted)	70
8.16 <u>Display of Derived Graphics</u>	70
8.16.1 <u>Display of Scale Bar</u>	70
8.16.2 <u>Display of Latitude Bar</u>	70
8.16.3 <u>Graticule Display</u>	70
8.16.4 <u>Grid Display</u>	70
8.16.5 <u>Magnetic Compass Rose Display</u>	70
8.16.6 <u>True Compass Rose Display</u>	70
8.17 <u>SENC Update Display</u>	71
8.17.1 <u>Display of Updates</u>	71
8.17.2 <u>Integrated Display</u>	71
8.17.3 <u>ENC Update Differentiation</u>	71
8.17.4 <u>ENC Update Identification</u>	71
8.17.5 <u>ENC Update Priority</u>	71
8.17.5.1 <u>Priority of Interactively Entered Updates</u>	71
8.17.6 <u>Display of Insertion and Deletion Updates</u>	71
8.17.7 <u>Highlighting of SENC Updates</u>	71
8.17.7.1 <u>Persistence of Updated Features Highlights</u>	72
8.17.8 <u>Display of Interactive Change Data Sets</u>	72
8.17.9 <u>Display of Amplifying Text</u>	72
8.17.10 <u>Identification of Amplifying Text Notes in Display</u>	72
8.17.11 <u>Display of Notice Duration</u>	72
8.18 <u>Display of Warnings, Alerts, and Notices</u>	72
8.18.1 <u>Navigation Hazard Alerts and Warnings</u>	72
8.18.2 <u>Persistence of Navigation Hazard Warnings</u>	73
8.18.3 <u>Display Scale Alert</u>	73
8.18.4 <u>Larger Scale Available Alert</u>	73
8.18.5 <u>Persistence of SENC Scale Alert</u>	73
8.18.6 <u>Scale Boundary Demarcation Line Alert</u>	73
8.18.7 <u>Persistence of Scale Boundary Demarcation Line</u>	73
8.18.8 <u>ENC Horizontal Datum Warning</u>	73
8.18.9 <u>Persistence of Horizontal Datum Warning</u>	73
8.18.10 <u>ENC Vertical Datum Notice</u>	74
8.18.11 <u>Persistence of Vertical Datum Notice</u>	74
8.18.12 <u>Chart Reliability Notice</u>	74
8.18.13 (deleted due to duplication by 8.18.12)	74
8.18.14 <u>Ship Off-Track Warning</u>	74
8.18.15 <u>Persistence of Ship Off-Track Warning</u>	74
8.18.16 <u>Detection of Abnormal or Hazardous Conditions</u>	74
8.18.16.1 <u>Abnormal or Hazardous Condition Warnings and Alarms</u>	74
8.18.16.2 <u>Persistence of Abnormal or Hazardous Condition Warnings and Alarms</u>	74
8.19 (moved to 8.13.2.5.3.3)	74
8.20 (deleted)	75
8.20.1 (moved to 9.7)	75

8.20.2 (moved to 8.15.5.5)	75
8.21 (moved to 8.13.2.5.3.4)	75
<u>9.1 Removal of Items from Display</u>	76
<u>9.1.1. Operator Control of Display Item Removal</u>	76
<u>9.2 Display Type Manipulations</u>	76
<u>9.2.1 Relative Motion Display</u>	76
<u>9.2.2 True Motion Display</u>	76
<u>9.2.2.1 Reset of True Motion Display</u>	76
<u>9.2.3 Indication of Display Mode</u>	76
<u>9.2.4 Change of Display Type</u>	76
<u>9.3 Interactive Change of Chart Area</u>	76
9.4 (deleted due to duplication by requirement 11.6.2)	77
<u>9.5 Display Zoom</u>	77
<u>9.5.1 Increase Display Magnification</u>	77
<u>9.5.1.1 Discrete Magnification</u>	77
<u>9.5.1.2 Continuous Increase in Magnification</u>	77
<u>9.5.2 Decrease Display Magnification</u>	77
<u>9.5.2.1 Discrete Magnification</u>	77
<u>9.5.2.2 Continuous Decrease in Magnification</u>	77
<u>9.5.3 Symbol Size During Zoom</u>	77
<u>9.6 Generation of Alternate Displays</u>	77
<u>9.6.1 Daylight Display</u>	78
<u>9.6.2 Twilight Display</u>	78
<u>9.6.3 Dusk Display</u>	78
<u>9.6.4 Night Display</u>	78
9.6.5 (moved to 9.6)	78
<u>9.6.5 Alphanumeric Display Dimming</u>	78
9.6.5.1 (combined with requirement 9.6.5)	78
<u>9.6.6 Use of Software Dimming</u>	78
<u>9.6.7 Display Adjustment Operator Controls</u>	78
<u>9.7 Placement of Flashing Symbols</u>	78
<u>9.7.1 Non-Chart Warnings Symbol</u>	79
<u>9.7.2 Preliminary Notice-to-Mariner Warning Symbol</u>	79
<u>9.7.3 Temporary Notice-to-Mariner Warning Symbol</u>	79
<u>9.7.4 Potential Hazard Description Symbol</u>	79
<u>9.8 Placement of Dangers Symbol</u>	79
<u>10.1 General Requirement</u>	80
<u>10.2 SENC Selection for Route Planning</u>	80
<u>10.2.1 Select by User Identification</u>	80
<u>10.2.1.1 Input of Cell Number</u>	80
<u>10.2.1.2 Selection from Available Databases</u>	80
<u>10.2.1.3 Select by Chart Number</u>	80
<u>10.2.1.4 Select by Rectangular Geographic Area</u>	80
<u>10.2.1.4.1 Select by Rectangular Geographic Area</u>	80
<u>10.2.1.5 Select by Geographic Area Polygon</u>	80
<u>10.2.1.5.1 Select by Geographic Area Polygon and Scale</u>	81
<u>10.2.1.6 Select from Stored Area Boundary</u>	81
<u>10.2.2 Selection by Index Map</u>	81
<u>10.3 Plan Chart Content and Configuration</u>	81
<u>10.3.1 SENC Content Display During Route Planning</u>	81
<u>10.3.2 Level of SENC Detail Reduction</u>	81
<u>10.4 Planned Route Definition</u>	81

<u>10.4.1 Interactive Placement of Waypoints</u>	81
<u>10.4.1.1 Placement of Waypoints by Key-in</u>	81
<u>10.4.1.2 Placement of Waypoints by Cursor</u>	82
<u>10.4.2 Identify or Name Waypoints</u>	82
<u>10.4.3 Linkage of Waypoints Comprising a Planned Route</u>	82
<u>10.4.3.1 Linkage of Waypoints via Cursor</u>	82
<u>10.4.3.2 Linkage of Waypoints via Name or ID</u>	82
<u>10.4.4 Identify or Name a Planned Route</u>	82
<u>10.4.5. Storage of Planned Route</u>	82
<u>10.4.6 Selection of Existing Routes</u>	82
<u>10.4.6.1 Select by Route Identification</u>	82
<u>10.4.6.1.1 Input of Route ID Number or Name</u>	82
<u>10.4.6.1.2 Selection from Available Routes</u>	83
<u>10.4.6.1.2.1 List Routes within Rectangular Geographic Area</u>	83
<u>10.4.6.1.2.2 List Routes within Geographic Area Polygon</u>	83
<u>10.4.6.2 Selection of Route from Index Map</u>	83
<u>10.5 Edit Waypoint and Route Data</u>	83
<u>10.5.1 Delete Waypoint</u>	83
<u>10.5.2 Move Waypoint</u>	83
<u>10.5.3 Rename Waypoint</u>	83
<u>10.5.4 (requirement deleted due to duplication by requirement 11.5.1)</u>	83
<u>10.5.5 Add Waypoint to Route</u>	83
<u>10.5.6 (deleted)</u>	83
<u>10.5.7 Rename Route</u>	83
<u>10.5.8 Copy Waypoints</u>	83
<u>10.5.9 Link Existing Waypoints to Form New Route</u>	84
<u>10.5.10 Delete Route</u>	84
<u>10.6 Manage Course and Distance Data</u>	84
<u>10.6.1 Compute Course and Distance Data</u>	84
<u>10.6.1.1 Selection of Distance Computation Method</u>	84
<u>10.6.1.2 Selection of Course Computation Method</u>	84
<u>10.6.2 Store Course and Distance Data</u>	84
<u>10.6.3 Display Course and Distance Data</u>	84
<u>10.6.3.1 Selection of Course Units</u>	84
<u>10.6.3.1.1 Default Course Units</u>	84
<u>10.6.3.2 Selection of Distance Units</u>	84
<u>10.6.3.2.1 Default Distance Units</u>	85
<u>10.7 Management of Wheel-Over Points</u>	85
<u>10.7.1 Interactive Placement of Wheel-over Points</u>	85
<u>10.7.1.1 Placement of Wheel-Over Points by Key-in</u>	85
<u>10.7.1.2 Placement of Wheel-Over Points by Cursor</u>	85
<u>10.7.2 Linkage of Wheel-Over Points to a Planned Route</u>	85
<u>10.7.3 Storage of Linked Wheel-Over Points</u>	85
<u>10.7.4 Edit of Wheel-Over Points</u>	85
<u>10.7.4.1 Delete Wheel-Over Point</u>	85
<u>10.7.4.2 Move Wheel-Over Point</u>	85
<u>10.7.4.3 (requirement deleted due to duplication by requirement 11.6.4.4 1)</u>	85
<u>10.7.4.4 Add Wheel-Over Point to Route</u>	85
<u>10.7.4.5 Delete all Wheel-Over Points on a Route</u>	86
<u>10.8 Management of Ship Turn Data</u>	86
<u>10.8.1 Interactive Entry of Turn Data</u>	86
<u>10.8.1.1 Entry of Turn Radius</u>	86

<u>10.8.1.2 Computation of Turn Rate</u>	86
<u>10.8.1.3 Entry of Turn Rate</u>	86
<u>10.8.2 Display of Turn Rate</u>	86
<u>10.8.3 Display of Turn Radius</u>	86
<u>10.8.3.1 Graphic Display of Turn Radius</u>	86
<u>10.8.3.2 Numerical Display of Turn Radius</u>	86
<u>10.8.4 Linkage of Ship Turn Data</u>	86
<u>10.8.4.1 Linkage of Ship Turn Data to Wheel-Over Points</u>	86
<u>10.8.4.2 Linkage of Ship Turn Data to Waypoints</u>	87
<u>10.8.5 Storage of Linked Turn Data</u>	87
<u>10.8.6 Edit of Turn Data</u>	87
<u>10.8.6.1 Delete Turn Data</u>	87
<u>10.8.6.1.1 Delete Turn Data Linked to a Wheel-Over Point</u>	87
<u>10.8.6.1.2 Delete Turn Data Linked to a Waypoint</u>	87
<u>10.8.6.2 Add Turn Data</u>	87
<u>10.8.6.2.1 Add Turn Data to a Wheel-Over Point</u>	87
<u>10.8.6.2.2 Add Turn Data to a Waypoint</u>	87
<u>10.8.6.3 Modify Turn Data</u>	87
<u>10.8.6.3.1 Modify Turn Data Linked to a Wheel-Over Point</u>	87
<u>10.8.6.3.2 Modify Turn Data Linked to a Waypoint</u>	87
<u>10.9 Store and Manage Operational Parameters</u>	88
<u>10.9.1 Ship Speed Data</u>	88
<u>10.9.1.1 Input Ship Speed Data</u>	88
<u>10.9.1.2 Store Ship Speed Data</u>	88
<u>10.9.1.3 Display Ship Speed Data</u>	88
<u>10.9.2 Voyage Start Time</u>	88
<u>10.9.2.1 Input Start Time</u>	88
<u>10.9.2.2 Store Start Time</u>	88
<u>10.9.2.3 Change Start Time</u>	88
<u>10.9.2.3.1 Interactive Change of Start Time</u>	88
<u>10.9.2.3.2 Automatic Change of Start Time</u>	88
<u>10.9.3 Ship Cruising Range Data</u>	89
<u>10.9.3.1 Input Ship Cruising Range Data</u>	89
<u>10.9.3.2 Store Ship Cruising Range Data</u>	89
<u>10.9.3.3 Display Ship Cruising Range Data</u>	89
<u>10.9.4 Ship Fuel Capacity Data</u>	89
<u>10.9.4.1 Input Ship Fuel Capacity Data</u>	89
<u>10.9.4.2 Store Ship Fuel Capacity Data</u>	89
<u>10.9.4.3 Display Ship Fuel Capacity Data</u>	89
<u>10.10 Compute Estimated Time of Arrival (ETA)</u>	89
<u>10.10.1 Display Estimated Time of Arrival (ETA)</u>	90
<u>10.11 Route Plan Development</u>	90
<u>10.11.1 Compute Route Plan</u>	90
<u>10.11.2 Display Route Plan</u>	90
<u>10.11.3 Print Route Plan</u>	90
<u>10.12 Manage Planning Support Data</u>	90
<u>10.12.1 (requirement deleted due to duplication)</u>	90
<u>10.12.2 Display Light List Data to Support Route Planning</u>	90
<u>10.12.3 Print Light List Data to Support Route Planning</u>	90
<u>10.12.4 Display Coast Pilot Data to Support Route Planning</u>	91
<u>10.12.5 Print Coast Pilot Data to Support Route Planning</u>	91
<u>10.12.6 Display Radio Warning Data to Support Route Planning</u>	91

<u>10.12.7 Print Radio Warning Data to Support Route Planning</u>	91
<u>10.12.8 Manage Tide/Current Data</u>	91
<u>10.12.8.1 Display Tide/Current Data to Support Route Planning</u>	91
<u>10.12.8.2 Print Tide/Current Data to Support Route Planning</u>	91
<u>10.13 Significant Danger Data Management</u>	91
<u>10.13.1 Identify and Tabulate Significant Dangers</u>	91
<u>10.13.1.1 Identify Significant Dangers via Key-in</u>	91
<u>10.13.1.2 Identify Significant Dangers using Cursor</u>	92
<u>10.13.1.3 (requirement combined with requirement 10.13.1)</u>	92
<u>10.13.2 Compute Danger Bearings</u>	92
<u>10.13.3 List of Significant Dangers and Danger Bearings</u>	92
<u>10.13.3.1 Store List of Significant Dangers and Danger Bearings</u>	92
<u>10.13.3.2 Display List of Significant Dangers and Danger Bearings</u>	92
<u>10.13.4 Print List of Significant Dangers and Danger Bearings</u>	92
<u>10.14 Perform Calculations, Transformations, and Measurements</u>	92
<u>10.15 Operator Interaction during Route Planning</u>	92
<u>11.1 Automatic Display of Planned Route</u>	93
<u>11.2 Highlight Information Vital to Navigation</u>	93
<u>11.2.1 Highlight Own-Ship Contour</u>	93
<u>11.2.2 Highlight Potential Hazards</u>	93
<u>11.2.2.1 Access to List of Significant Dangers and Danger Bearings</u>	93
<u>11.2.2.2 (requirement combined with requirement 11.2.2.1)</u>	93
<u>11.3.3 Highlight Own-Ship's Planned Route</u>	93
<u>11.3.3.1 Display Route Plan Summary</u>	93
<u>11.3.3.2 Print Route Plan</u>	94
<u>11.3.4 Highlight Own-Ship's Symbol</u>	94
<u>11.3.5 Highlight Own-Ship's Heading</u>	94
<u>11.3.6 Highlight Own-Ship's Velocity Vector</u>	94
<u>11.3.7 Highlight Own-Ship's Past-Track</u>	94
<u>11.3.8 Highlight Obligatory Instructions</u>	94
<u>11.4 Display of Charts During Route Monitoring</u>	94
<u>11.4.1 Display Orientation</u>	94
<u>11.4.1.1 "North-Up" Orientation</u>	94
<u>11.4.1.2 "Course-Up" Orientation</u>	95
<u>11.4.1.3 Default Orientation</u>	95
<u>11.4.2 Use of Simplified Symbolology</u>	95
<u>11.4.3 Display Point, Line and Area Features</u>	95
<u>11.4.4 Display Mode</u>	95
<u>11.4.4.1 Relative Motion Display</u>	95
<u>11.4.4.2 True Motion Display</u>	95
<u>11.4.4.3 Default Display Mode</u>	95
<u>11.4.4.4 Display Mode and Orientation Combinations</u>	95
<u>11.4.5 Continuous SENC Display</u>	96
<u>11.4.5.1 SENC Display Along Route</u>	96
<u>11.4.5.2 SENC Display Contiguous to Route</u>	96
<u>11.4.5.3 Display Refresh</u>	96
<u>11.4.5.4 Display Refresh Rate</u>	96
<u>11.4.6 Automatic Chart Changing</u>	96
<u>11.4.6.1 Chart Changing for Alternate Display Modes</u>	96
<u>11.4.6.2 Chart Changing for Alternate Display Orientation</u>	96
<u>11.4.6.3 Manual Override of Automatic Chart Changing</u>	96
<u>11.4.7 Display of SENCs Not Containing Vessel Location</u>	96

<u>11.4.7.1 Display of SENCs Along Planned Route</u>	96
<u>11.4.7.2 Display of SENCs Contiguous to Planned Route</u>	97
<u>11.4.7.3 Ad-Hoc Display of On-line SENCs</u>	97
<u>11.4.8 Display of Charts on ECDIS Screens</u>	97
<u>11.4.9 Display of Chart Change Boundary</u>	97
<u>11.4.9.1 Interactive Modification of Chart Change Boundary</u>	97
<u>11.5 Use of Radar to support Route Monitoring</u>	97
<u>11.5.1 Radar Display Modes</u>	97
<u>11.5.2 Chart Selection to Support Radar</u>	97
<u>11.5.3 Use of ARPA Targets</u>	97
<u>11.5.3.1 Display of ARPA Targets</u>	98
<u>11.6 Display of Own-Ship Position</u>	98
<u>11.6.1 Own-Ship Position Display Persistence</u>	98
<u>11.6.2 Locate Own-Ship Position</u>	98
<u>11.6.3 (deleted due to duplication by requirement 9.4)</u>	98
<u>11.7 Determination of Position Within Area</u>	98
<u>11.7.1 Determination of Position Relative to Area</u>	98
<u>11.7.2 Determination of ETA at Area</u>	98
<u>11.8 Identification of Ship Track Versus Planned Route</u>	98
<u>11.9 Computations, Retrieval, and Display of Track Data</u>	99
<u>11.9.1 Display of Time-Labels Along Track</u>	99
<u>11.9.1.1 Automatic Display of Time-Labels</u>	99
<u>11.9.1.2 Heading-to-Steer to Next Waypoint</u>	99
<u>11.9.1.3 Heading-to-Steer to Next Wheel over Point</u>	99
<u>11.9.1.4 Heading-to-Steer to Geographic Position</u>	99
<u>11.9.1.5 Distance-to-Go to Next Waypoint</u>	99
<u>11.9.1.6 Distance-to-Go to Next Wheel over Point</u>	99
<u>11.9.1.7 Distance-to-Go to Geographic Position</u>	99
<u>11.10 Compute Off-Track Error</u>	99
<u>11.11 Display Movable Electronic Bearing Lines</u>	100
<u>11.12 Display Variable Range Markers</u>	100
<u>11.13 Display Fixed Range Markers</u>	100
<u>11.14 Sounding Display During Route Monitoring</u>	100
<u>11.14.1 Sounding Display Relative to Ship's Draft</u>	100
<u>11.15 Processing of Tide Information</u>	100
<u>11.16 Navigation Related Data Queries</u>	100
<u>11.16.1 Chart Feature Data Queries</u>	100
<u>11.16.2 Display of Navigation Related Data</u>	100
<u>11.17 (moved to 8.18.16)</u>	101
<u>11.18 Course and Speed Vectors</u>	101
<u>11.18.1 Default Course and Speed Vector</u>	101
<u>11.18.2 User-Defined Course and Speed Vector</u>	101
<u>11.19 Processing and Display of Current Information</u>	101
<u>11.19.1 Input Current Data</u>	101
<u>11.19.1.1 Interactive Input of Current Data</u>	101
<u>11.19.1.2 Automatic Input of Current Data</u>	101
<u>11.19.2 Store Current Data</u>	102
<u>11.19.3 (deleted)</u>	102
<u>11.19.4 Display of Current Information</u>	102
<u>12.1 Storage of Own-Ship Track Data</u>	103
<u>12.1.1 Vessel Position Recording</u>	103
<u>12.1.1.1 Vessel Position Collection Default</u>	103

<u>12.1.2 Vessel Position Collection Interval Selection</u>	103
<u>12.1.3 Vessel Speed Recording</u>	103
<u>12.1.4 Vessel Course Recording</u>	103
<u>12.1.5 Vessel Rudder Angle Recording</u>	103
<u>12.1.6 Chart Display Configuration Data</u>	103
<u>12.1.7 Record of Chart Updates</u>	104
<u>12.1.8 Plan Variance Data</u>	104
<u>12.1.8.1 Variance in Plan Text Display</u>	104
<u>12.1.8.2 Variance in Plan Text Report</u>	104
<u>12.2 Storage Interval for Own-Ship Track Data</u>	104
<u>12.3 Preparation of Ship's Log</u>	104
<u>12.3.1 Ship Log Summary Report</u>	104
<u>12.4 Reconstruction of EC Display From History Information</u>	104
<u>12.5 Reconstruction of Own-Ship Track Data</u>	104
<u>13.1 Position Display</u>	105
<u>13.1.1 Latitude and Longitude Position Display</u>	105
<u>13.1.2 Projection (Grid) Coordinate Display</u>	105
<u>13.2 Perform Projection Calculations</u>	105
<u>13.2.1 Compute True Distance</u>	105
<u>13.2.2 Compute Grid Distance</u>	105
<u>13.2.3 Compute Geodetic Azimuth</u>	105
<u>13.2.4 True Bearing</u>	105
<u>13.2.5 Compute Geographic Position at Known Azimuth and Distance</u>	105
<u>13.2.6 Compute Geographic Position at Known Bearing and Distance</u>	106
<u>13.2.7 Position Determination</u>	106
<u>13.2.7.1 Position Determination from Hyperbolics</u>	106
<u>13.2.7.1.1 Least Squares Hyperbolic Position Determination</u>	106
<u>13.2.7.2 Position Determination from Pseudo Ranges</u>	106
<u>13.2.7.2.1 Least Squares Pseudo Range Position Determination</u>	106
<u>13.2.7.3 Position Determination from Dead Reckoning</u>	106
<u>13.2.8 Rhumb Line Calculations</u>	106
<u>13.2.9 Convergence Calculations</u>	106
<u>13.2.10 Great Circle on a Grid Calculations</u>	107
<u>13.2.11 True Circle Calculations</u>	107
<u>13.2.12 Great Circle Calculations</u>	107
<u>13.2.13 Accuracy of Calculations with respect to Rhumb Line</u>	107
<u>13.2.14 Accuracy of Calculations with respect to Great Circle</u>	107
<u>13.3 Magnetic Bearing</u>	107
<u>13.4 Magnetic Variation</u>	107
<u>13.5 Arithmetic Calculations</u>	107
<u>13.5.1 Addition</u>	107
<u>13.5.2 Subtraction</u>	107
<u>13.5.3 Multiplication</u>	107
<u>13.5.4 Division</u>	108
<u>13.5.5 Square Root</u>	108
<u>13.5.6 Sine</u>	108
<u>13.5.7 Cosine</u>	108
<u>13.5.8 Tangent</u>	108
<u>13.5.9 Arc Sine</u>	108
<u>13.5.10 Arc Cosine</u>	108
<u>13.5.11 Arc Tangent</u>	108
<u>13.5.12 (requirement deleted because functionality identified as not needed)</u>	108

13.6 Unit Conversions	108
13.6.1 Feet/Tenths to Fathoms/Feet Conversion	109
13.6.2 Feet/Fractions to Fathoms/Feet Conversion	109
13.6.3 Feet/Fractions to Fathoms/Fractions Conversion	109
13.6.4 Feet/Tenths to Fathoms/Fractions Conversion	109
13.6.5 Meters to Fathoms/Feet Conversion	109
13.6.6 Meters to Fathoms/Fractions Conversion	109
13.6.7 Fathoms/Feet to Feet/Tenths Feet Conversion	109
13.6.8 Fathoms/Fractions to Feet/Tenths Feet Conversion	109
13.6.9 Fathoms/Fractions to Feet/Fractions Conversion	109
13.6.10 Fathoms/Feet to Feet/Fractions Conversion	109
13.6.11 Fathoms/Fractions to Meters Conversion	110
13.6.12 Fathoms/Feet to Meters Conversion	110
13.6.13 Decimal Degrees to Degrees, Minutes, Seconds Conversion	110
13.6.14 Degrees, Minutes, Seconds to Decimal Degrees Conversion	110
13.6.15 Decimal Degrees to Degrees and Decimal Minutes Conversion	110
13.6.16 Degrees, Minutes, Seconds to Degrees and Decimal Minutes Conversion	110
13.6.17 Degrees and Decimal Minutes to Decimal Degrees Conversion	110
13.6.18 Degrees and Decimal Minutes Conversion	110
13.6.19 Nautical Miles to Statute Miles Conversion	110
13.6.20 Statute Miles to Nautical Miles Conversion	110
13.6.21 Knots to Statute Miles Conversion	111
13.6.22 Knots to Kilometers Conversion	111
13.6.23 Statute Miles to Kilometers Conversion	111
13.6.24 Kilometers to Statue Miles Conversion	111
13.7 Projection Management	111
13.7.1 Coordinate Transformation	111
13.7.2 Spheroids	111
13.7.3 Map Projections and Coordinate Systems	111
13.7.4 Horizontal Geodetic Datum Transformations	112
13.8 (requirement deleted due to duplication of requirement 11.7.7)	112
13.9 (requirement deleted due to statement of non-requirement).	112
13.10 Use of HO Conversion Tables	112
13.11 Validation of Conversions	112
13.12 Time Data Management	112
13.12.1 Maintain Internal Time	112
13.12.2 Display UTC (GMT) Time	113
13.12.3 Display Local Time	113
13.12.4 Manage and Update Time Zone Variations	113
13.12.5 Manage Temporary Time Zone Variables	113
13.12.6 Display Time in Selected Zone	113
13.12.7 Display Time Based on Ship Position	113
13.12.8 Display Time in Selected Position	113
13.12.9 Time Zone Alert	113
13.12.10 Reset Time	113
13.13 Wind Velocity and Direction	113
14.1 Chart Index	114
14.1.1 General Requirement	114
14.1.2 Display Requirements	114
14.1.2.1 Display On-Line System Electronic Navigation Chart Outlines	114
14.1.2.2 Display Off-Line System Electronic Navigation Chart Outlines	114
14.1.2.3 Display On-Line Electronic Navigation Chart Data Cell Outlines	114

14.1.2.4 Display Off-Line Electronic Navigation Chart Data Cell Outlines	114
14.1.2.5 Display Chart Outlines	114
14.1.2.6 Display Planned Routes	114
14.1.3 Related Information Display	114
14.1.3.1 Display Related SENC Information	114
14.1.3.2 Display Related ENC Information	115
14.1.3.3 Display Related Chart Information	115
14.1.3.4 Display Planned Route Related Data	115
14.1.4 Display Generalized Coastlines	115
14.1.5 Index Map Zooming	115
14.1.6 Display of Ancillary Data Outlines	115
14.1.7 Index Map Query and Selection Functions	116
14.1.7.1 Select by Rectangular Fence on Index Map	116
14.1.7.2 Select by Polygonal Fence on Index Map	116
14.1.7.3 Select by Rectangular Fence and Scale on Index Map	116
14.1.7.4 Select by Polygonal Fence and Scale on Index Map	116
14.1.7.5 Select by Outline	116
14.1.8 Maintenance of Index Map	116
14.1.8.1 Load and Store Shoreline Data	116
14.1.8.1.1 Replace Existing Shoreline Data	116
14.1.8.2 Load and Store ENC and Chart Outlines	116
14.1.8.2.1 Replace Existing ENC and Chart Outlines	117
14.1.8.3 Generate and Store SENC Outlines	117
14.1.8.3.1 Delete Existing SENC Outlines	117
14.1.8.4 Generate and Store User Defined Boundary Polygons	117
14.1.8.4.1 Delete Existing Boundary Polygons	117
14.1.8.5 Generate and Store User Defined Boundary Lines	117
14.1.8.5.1 Delete Existing Boundary Lines	117
14.1.8.6 Index Map Display Initialization	117
14.1.8.7 Index Map Display Color Management	117
14.1.8.8 Index Map Symbol Management	117
14.1.9 Display of Index Map	117
14.1.9.1 Index Map Display Symbolology	118
14.1.9.2 Index Map Screen Display	118
14.2 Catalogs	118
14.2.1 Chart Catalog	118
14.2.2 (deleted due to duplication by requirement 14.1.3.2)	118
14.2.3 Coast Pilot Catalog	118
14.3 Libraries	118
14.3.1 Presentation Library	118
14.3.1.1 Presentation Library Abbreviations	118
15.1 General Requirement	119
15.2 Use of Single Action Controls	119
15.2.1 Maximum Number of Single Action Controls	119
15.3 (deleted due to subjectivity)	119
15.4 (requirement deleted due to duplication)	119
15.5 Route Monitoring Interface	119
15.5.1 Response to Operator Instructions During Route Monitoring	119
15.5.2 Route Monitoring Function Selection	119
15.6 Human Factors Consideration in Route Monitoring Task Execution	119
15.7 Display of Alphanumeric Information During Route Monitoring	120
15.8 Use of Windows	120

<u>15.9 User Interface Language</u>	120
<u>16.1 Navigation-Related Data Inputs</u>	121
<u>16.2 Navigation-Related Data Outputs</u>	121
<u>16.3 Electronic Interface Type</u>	121
<u>16.3.1 IEEE RS232 Interface</u>	121
<u>16.3.2 IEEE RS422 Interface</u>	121
<u>16.3.3 Local Area Network (LAN)</u>	122
<u>16.3.3.1 IEEE 802.3 Standard LAN</u>	122
<u>16.3.3.2 IEEE 802.5 Standard LAN</u>	122
<u>16.3.3.3 LAN Communications Protocol</u>	122
<u>16.3.3.4 Modem Communications</u>	122
<u>16.4 Physical Interface Standard</u>	122
<u>16.5 Interface Protocol</u>	122
<u>16.6 Management of Navigation-Related Device Inputs</u>	122
<u>16.6.1 Configuration of Navigation-Related Device Inputs</u>	122
<u>16.6.2 Identification of Operational Systems</u>	122
<u>16.6.3 Selection of Navigation-Related Device Inputs</u>	123
<u>16.6.4 Number of Inputs Interfaced</u>	123
<u>16.6.5 Degradation of Navigation Support Equipment Performance</u>	123
<u>16.6.6 Degradation of Ancillary Equipment Performance</u>	123
<u>16.7 Minimum On-Board System Configuration</u>	123
<u>16.8 Reduced-Configuration Operational Conditions</u>	123
<u>16.8.1 GPS-Only Interface</u>	123
<u>16.8.2 LORAN C-Only Interface</u>	123
<u>16.8.3 DECCA-Only Interface</u>	123
<u>16.8.4 TRANSIT-Only Interface</u>	124
<u>16.9 Global Positioning System (GPS) Receiver Interface</u>	124
<u>16.9.1 GPS Data Inputs</u>	124
<u>16.9.1.1 Format for GPS Input</u>	124
<u>16.9.2 ECDIS Outputs to GPS Receivers</u>	124
<u>16.9.2.1 Format for Output to GPS Receivers</u>	124
<u>16.9.3 GPS System Alarms</u>	124
<u>16.9.3.1 Format for GPS Alarm Input</u>	124
<u>16.9.3.2 Persistence of GPS Alarms</u>	125
<u>16.10 LORAN-C Receiver Interface</u>	125
<u>16.10.1 LORAN-C Data Inputs</u>	125
<u>16.10.1.1 Format for LORAN-C Input</u>	125
<u>16.10.2 ECDIS Outputs to LORAN-C Receivers</u>	125
<u>16.10.2.1 Format for Output to LORAN-C Receivers</u>	125
<u>16.10.3 LORAN-C System Alarms</u>	125
<u>16.10.3.1 Format for LORAN-C Alarm Input</u>	125
<u>16.10.3.2 Persistence of LORAN-C Alarms</u>	126
<u>16.11 DECCA Receiver Interface</u>	126
<u>16.11.1 DECCA Data Inputs</u>	126
<u>16.11.1.1 Format for DECCA Input</u>	126
<u>16.11.2 ECDIS Outputs to DECCA Receivers</u>	126
<u>16.11.2.1 Format for Output to DECCA Receivers</u>	126
<u>16.11.3 DECCA System Alarms</u>	126
<u>16.11.3.1 Format for DECCA Alarm Input</u>	126
<u>16.11.3.2 Persistence of DECCA Alarms</u>	127
<u>16.12 Gyrocompass Interface</u>	127
<u>16.12.1 Gyrocompass Data Inputs</u>	127

<u>16.12.1.1 Format for Gyrocompass Input</u>	127
16.12.2 (requirement deleted because functionality not needed)	127
16.12.2.1 (requirement deleted because functionality not needed)	127
<u>16.12.3 Gyrocompass System Alarms</u>	127
<u>16.12.3.1 Format for Gyrocompass Alarm Input</u>	127
<u>16.12.3.2 Persistence of Gyrocompass Alarms</u>	127
<u>16.14 TRANSIT Receiver Interface</u>	127
<u>16.14.1 TRANSIT Data Inputs</u>	128
<u>16.14.1.1 Format for TRANSIT Input</u>	128
<u>16.14.2 ECDIS Outputs to TRANSIT Receivers</u>	128
<u>16.14.2.1 Format for Output to TRANSIT Receivers</u>	128
<u>16.14.3 TRANSIT System Alarms</u>	128
<u>16.14.3.1 Format for TRANSIT Alarm Input</u>	128
<u>16.14.3.2 Persistence of TRANSIT Alarms</u>	128
<u>16.15 Speed Log Interface</u>	128
<u>16.15.1 Speed Log Data Inputs</u>	129
<u>16.15.1.1 Format for Speed Log Input</u>	129
<u>16.15.2 ECDIS Outputs to Speed Log Devices</u>	129
<u>16.15.2.1 Format for Output to Speed Log Devices</u>	129
<u>16.15.3 Speed Log System Alarms</u>	129
<u>16.15.3.1 Format for Speed Log Alarm Input</u>	129
<u>16.15.3.2 Persistence of Speed Log Alarms</u>	129
<u>16.16 Depth Sounder Interface</u>	129
<u>16.16.1 Depth Sounder Data Inputs</u>	130
<u>16.16.1.1 Format for Depth Sounder Input</u>	130
<u>16.16.2 ECDIS Outputs to Depth Sounder Devices</u>	130
<u>16.16.2.1 Format for Output to Depth Sounder Devices</u>	130
<u>16.16.3 Depth Sounder System Alarms</u>	130
<u>16.16.3.1 Format for Depth Sounder Alarm Input</u>	130
<u>16.16.3.2 Persistence of Depth Sounder Alarms</u>	130
<u>16.16.3.3 Persistence of Depth Warning Alarm</u>	130
<u>16.17 Weather Measurement System Interface</u>	131
<u>16.17.1 Weather Measurement System Data Inputs</u>	131
<u>16.17.1.1 Format for Weather Measurement System Input</u>	131
<u>16.17.2 ECDIS Outputs to Weather Measurement System Devices</u>	131
<u>16.17.2.1 Format for Output to Weather Measurement System Devices</u>	131
<u>16.17.3 Weather Measurement System Alarms</u>	131
<u>16.17.3.1 Format for Weather Measurement System Alarm Input</u>	132
<u>16.17.3.2 Persistence of Weather Measurement System Alarms</u>	132
<u>16.18 Rudder Position Measurement Interface</u>	132
<u>16.18.1 Rudder Position Measurement Data Inputs</u>	132
<u>16.18.1.1 Format for Rudder Position Measurement Input</u>	132
<u>16.18.2 ECDIS Outputs to Rudder Position Measurement Devices</u>	132
<u>16.18.2.1 Format for Output to Rudder Position Measurement Devices</u>	132
<u>16.18.3 Rudder Position Measurement System Alarms</u>	133
<u>16.18.3.1 Format for Rudder Position Measurement Alarm Input</u>	133
<u>16.18.3.2 Persistence of Rudder Position Measurement System Alarms</u>	133
<u>16.19 Autopilot Systems Interface</u>	133
<u>16.19.1 Autopilot Data Inputs</u>	133
<u>16.19.1.1 Format for Autopilot Input</u>	133
<u>16.19.2 ECDIS Outputs to Autopilot Devices</u>	133
<u>16.19.2.1 Format for Output to Autopilot Devices</u>	133

16.19.3 Autopilot Alarms	134
16.19.3.1 Format for Autopilot Alarm Input	134
16.19.3.2 Persistence of Autopilot Alarms	134
16.20 ARPA Target Data Input	134
16.20.1 ARPA Data Inputs	134
16.20.1.1 Format for ARPA Input	134
16.20.2 ECDIS Outputs to ARPA Systems	135
16.20.2.1 Format for Output to ARPA Systems	135
16.20.3 ARPA Symbolology	135
16.20.4 (requirement deleted because functionality identified as not needed)	135
16.20.5 Radar/ARPA System Alarms	135
16.20.5.1 Format for ARPA Alarm Input	135
16.20.5.2 Persistence of Radar/ARPA Alarms	135
16.21 Radar Video Input	135
16.21.1 Format for Radar Video Input to ECDIS	135
16.21.2 ECDIS Outputs to Radar Systems	136
16.21.2.1 Format for Output to Radar Systems	136
16.21.3 ECDIS SENC Data Export to Radar Systems	136
16.21.3.1 Export Format for SENC Output to Radar Systems	136
16.21.3.2 SENC Symbolology	136
16.21.4 (requirement deleted because functionality identified as not needed)	136
16.21.5 Radar System Alarms	136
16.21.5.1 Format for Radar Alarm Input	136
16.21.5.2 Persistence of Radar Alarms	136
16.21.6 Standard Error of Range Displays	136
16.22 Interface of Multi-Source Position Navigation Filtering Devices	137
16.22.1 Multi-Source Navigation Data Filtering Device Inputs	137
16.22.1.1 Minimum Data Inputs	137
16.22.1.2 Filter Computation Data Inputs	137
16.22.1.3 Format for Multi-Source Navigation Data Filtering Device Data	137
16.22.2 ECDIS Outputs to Multi-Source Navigation Data Filtering Devices	137
16.22.2.1 Format for Output to Multi-Source Navigation Data Filtering Devices	137
16.22.3 Multi-Source Navigation Data Filtering Devices Alarms	137
16.22.3.1 Format for Multi-Source Navigation Data Filtering Device Alarm Input	137
16.22.3.2 Persistence of Multi-Source Navigation Data Filtering Device Alarms	138
16.23 Satellite Communications System Interface	138
16.23.1 Communications System Data Inputs	138
16.23.1.1 Format for Communications System Input	138
16.23.2 Communications System Alarms	138
16.23.2.1 Format for Communications System Alarm Input	138
16.23.2.2 Persistence of Communications Alarms	138
17.1 ECDIS Hardware Configuration	139
17.1.1 Identify Display Configuration	139
17.1.2 Identify Input Devices	139
17.1.3 Identify Mass Storage Devices	139
17.1.4 Identify Off-line Storage Devices	139
17.1.5 Identify Printing Devices	139
17.2 Initialization of Navigation System Interfaces	139
17.2.1 Initialize Navigation System IDs	139
17.2.2 Identify Navigation System Interface Ports	139
17.2.3 Enable/Disable Navigation System Input	139
17.2.4 Initialize Navigation System Input Data Rate	140

<u>17.2.5 Initialize Navigation System Input Frequency</u>	140
<u>17.2.5.1 Initialize Navigation System Input Processing Frequency</u>	140
<u>17.2.6 Initialize Navigation System Input Characteristics and Format</u>	140
<u>17.2.7 Define Navigation System Input Content</u>	140
<u>17.2.8 Define and Store Navigation System Data Ranges</u>	140
<u>17.3 Alarm and Warning Initialization</u>	140
<u>17.3.1 Initialize Warning Message Display</u>	140
<u>17.3.2 Initialize Warning Message Display Persistence</u>	140
<u>17.3.3 Initialize Warning Message Text</u>	140
<u>17.3.4 Initialize Audible Alarm</u>	141
<u>17.3.5 Initialize Audible Alarm Persistence</u>	141
<u>17.3.6 Initialize Audible Alarm Type</u>	141
<u>17.4 Time and Date Initialization</u>	141
<u>17.4.1 Initialize System Time/Date</u>	141
<u>17.4.2 Initialize Time Zone Boundaries</u>	141
<u>17.4.3 Initialize System Time Zone Deltas</u>	141
<u>17.4.3.1 Initialize Daylight/Standard Time Zones</u>	141
<u>17.5 Default Unit Initialization</u>	141
<u>17.5.1 Initialize Position Units</u>	141
<u>17.5.2 Initialize Speed Units</u>	141
<u>17.5.3 Initialize Draft Units</u>	142
<u>17.5.4 Initialize Depth Units</u>	142
<u>17.5.5 Initialize Height Units</u>	142
<u>17.5.6 Initialize Distance Units</u>	142
<u>17.5.7 Azimuth/Bearing</u>	142
<u>17.5.8 Initialize Turn Rate Units</u>	142
<u>17.5.9 Initialize Wind Speed Units</u>	142
<u>17.5.10 Initialize Temperature Units</u>	142
<u>17.5.11 (requirement deleted because functionality identified as not needed)</u>	142
<u>17.5.12 Initialize Time Units</u>	142
<u>17.6 Display Configuration Initialization</u>	143
<u>17.6.1 Initialize Display Content</u>	143
<u>17.6.2 Initialize Display Hierarchy</u>	143
<u>17.6.3 Initialize Display Configuration</u>	143
<u>17.6.4 Initialize Display Mode</u>	143
<u>17.6.5 Initialize Display Alteration Parameters</u>	143
<u>17.7 Display Color Initialization</u>	143
<u>17.7.1 Initialize Daytime Colors</u>	143
<u>17.7.2 Initialize Twilight Colors</u>	143
<u>17.7.3 Initialize Dusk Colors</u>	143
<u>17.7.4 Initialize Night Colors</u>	143
<u>17.7.5 Display Color Management to Support Test</u>	144
<u>17.8 Display Symbolology Initialization</u>	144
<u>17.8.1 Create Symbols</u>	144
<u>17.8.1.1 Create Point Symbols</u>	144
<u>17.8.1.2 Create Line Symbols</u>	144
<u>17.8.1.3 Create Area Symbols and Patterns</u>	144
<u>17.8.2 Add Symbols</u>	144
<u>17.8.2.1 Add Point Symbols</u>	144
<u>17.8.2.2 Add Line Symbols</u>	144
<u>17.8.2.3 Add Area Symbols and Patterns</u>	144
<u>17.8.2.4 Add Text</u>	144

<u>17.8.3 Delete Symbols</u>	144
<u>17.8.3.1 Delete Point Symbols</u>	145
<u>17.8.3.2 Delete Line Symbols</u>	145
<u>17.8.3.3 Delete Area Symbols and Patterns</u>	145
<u>17.8.3.4 Delete Text</u>	145
<u>17.8.4 Review Symbols and Text</u>	145
<u>17.8.4.1 Review Point Symbols</u>	145
<u>17.8.4.2 Review Line Symbols</u>	145
<u>17.8.4.3 Review Area Symbols and Patterns</u>	145
<u>17.8.4.4 Review Text</u>	145
<u>17.8.5 Symbology Correction</u>	145
<u>17.8.5.1 Edit Point Symbols</u>	145
<u>17.8.5.2 Edit Line Symbols</u>	146
<u>17.8.5.3 Edit Area Symbols and Patterns</u>	146
<u>17.8.6 Symbol Lookup Tables</u>	146
<u>17.8.6.1 Creation of Symbol Lookup Table Files</u>	146
<u>17.8.6.2 Edit Symbol Lookup Tables Files</u>	146
<u>17.9 System Help File Initialization</u>	146
<u>17.9.1 Create Help Files</u>	146
<u>17.9.2 Editing Help Files</u>	146
<u>17.10 History Collection Initialization</u>	146
<u>17.10.1 Define History File Input Content</u>	146
<u>17.10.2 Define History File Format</u>	146
<u>17.10.3 Define History Data Collection Rate</u>	146
<u>17.10.4 Define History File Update Frequency</u>	146
<u>18.1 General Backup/Restore Requirement</u>	147
<u>18.2 System Backup Data Content</u>	147
<u>18.3 Radar Video Backup</u>	147
<u>18.4 Types of System Backup/Restore</u>	147
<u>18.4.1 Full Media System Backup/Restore</u>	147
<u>18.4.2 Incremental System Backup/Restore</u>	147
<u>18.4.3 Time/Date Sensitive System Backup/Restore</u>	147
<u>18.4.4 User Selected System Backup/Restore</u>	147
<u>18.5 System Backup Mode</u>	147
<u>18.6 Effect of System Backup on ECDIS Operations</u>	147
<u>18.7 System Backup Frequency</u>	148
<u>18.8 Frequency of Radar Backup</u>	148
<u>18.9 System Backup Media</u>	148
<u>19.1 System Access Security</u>	149
<u>19.1.1 User Logon Facility</u>	149
<u>19.1.2 Logon Privileges</u>	149
<u>19.1.3 User ID/Password Maintenance</u>	149
<u>19.2 System Logon/Logoff Transaction Log</u>	149
<u>19.2.1 Printing of Logon/Logoff Transaction Log</u>	149
<u>19.2.2 Maintenance Life of Logon/Logoff Transaction Log</u>	149
<u>19.3 Protection from Unauthorized or Inadvertent Access</u>	150
<u>20.1 Primary Power Source</u>	151
<u>20.2 Alternate Power Source</u>	151
<u>20.3 Changing Power Sources</u>	151
<u>21.1 Warning of System Malfunctions</u>	152
<u>21.1.1 Startup Failures</u>	152
<u>21.1.2 Failures During Operation</u>	152

APPENDIX C: Glossary of Terms and Acronyms

ARPA

Automatic Radar Plotting Aid

Conventional Nautical Chart

A paper chart produced by a National Hydrographic Authority issued to support safe navigation.

EC

Electronic Chart

ECDB

Electronic Chart Data Base - A master data base of chart information held in digital form by the National Hydrographic Authority.

ECDIS

Electronic Chart Display and Information System - A system which displays the ENC in a form equivalent to a conventional nautical chart and may also display complementary navigational information and which may combine that data with position information from electronic navigational aids, collision avoidance radar information, etc. to assist in the safe navigation of a ship.

ENC

Electronic Navigational Chart - A subset of the ECDB furnished by a National Hydrographic Authority held on the ship. It contains sufficient information for navigation that an appropriate display from it would be considered the equivalent of a conventional nautical chart.

ENCD

Electronic Navigational Chart Data - The national data for an Electronic Navigation Chart in a transfer format acceptable to a Regional or Global ENC Coordinator.

ENCDB

Electronic Navigational Chart Data Base - The ENC data in the form of a data base, i.e., within the framework of a data base management system.

HO

Hydrographic Office

IHO

International Hydrographic Organization

INMARSAT

International Maritime Satellite Organization

IMO

International Maritime Organization

MSI

Maritime Safety Information

NAVAID

Aid to Navigation

NAVAREA

Division of the Long Range Radio Navigational Warnings Broadcasts Service for Mariners

NAVTEX

International Automatic MSI Broadcast on 518 kHz

NAVINFONET

Navigation Information Network, a US (DMA) automated service for providing Maritime Safety Information via digital data link at user request.

NTM

Notice to Mariner

RTCM

Radio Technical Commission for Maritime Services

SENC

System Electronic Navigational Chart - The ENC as transformed by the ECDIS software into the data base used by the ECDIS. It is organized for optimum use by the ECDIS.

SOLAS

Convention on Safety of Life at Sea

August 1, 1991

ECDIS SRS/Version 2.2

TRACK

The path connecting two waypoints is a track.

WAYPOINT

A waypoint may be any significant navigation event; it is usually a turning point.

APPENDIX D: SRS Comment Form

The form included in this appendix is provided as a means of commenting on the requirements included in the System Requirements Specification. Reviewers are encouraged to use this form to provide comment on technical requirements inaccuracies, requirements misstatements, and errors of omission. Completed forms can be submitted to the following address. Forms may also be submitted via FAX to (703) 264-7131.

Intergraph Corporation
2051 Mercator Drive
Reston, VA 22091

c/o David J. Scott

APPENDIX E: Mapping of Default Display Objects to IMO List of Default Display Items

Note: See requirement 8.2.1 in reference to Default Display Objects. The IMO List of Default Display Items is taken from reference 2.1, page II, paragraph 3.2.

1. coastline

Canal
Canal-bank
Coastline
Lake
Lake-shore
Land area
River
River-bank
Shoreline construction

2. drying line

Intertidal area
Zero-meter contour

3. indication of isolated dangers

Isolated danger symbol
Diffuser
Underwater rock

4. own ships safety depth contour, to be selected out of the depth contours provided for in the ENC

Own ship's safety depth contour and label
Depth area

5. indication of fixed and floating aids to navigation

Simplified beacon symbol
Simplified buoy symbol
Cardinal buoy or beacon
Fog signal
Tower

6. boundaries of fairways, channels, etc.

Fairway
Dredged area

7. routing systems

- Deep water route - part
- Deep water route - centerline
- Ferry route
- Navigation line
- Precautionary area
- Recommended route-centerline
- Recommended track
- Recommended traffic lane part
- Submarine transit lane
- Traffic separation line
- Traffic separation scheme - boundary
- Traffic separation scheme - crossing
- Traffic separation scheme - lane part
- Traffic separation scheme - roundabout
- Traffic separation zone
- Traffic separation scheme - system (compound feature)
- Two-way route - part

8. visual and radar conspicuous features

- Radar reflector
- Any object with a CONRAD attribute value = 1 (radar conspicuous)
- Any object with a CONVIS attribute value = 1 (visual conspicuous)

9. prohibited and restricted areas

- Anchorage area
- Cable area
- Cargo transshipment area
- Dumping ground
- Incineration area
- Military practice area
- Pipeline area
- Restricted area
- Seaplane landing area
- Spoil ground

10. indication of cautionary notes

- Any object with the INFORM attribute
- Water turbulence

11. scale bar

12. chart scale boundaries

13. indication of units of depths and heights

August 1, 1991

ECDIS SRS/Version 2.2

DOCUMENT LIBRARY

March 11, 1991

Distribution List for Technical Report Exchange

Attn: Stella Sanchez-Wade
Documents Section
Scripps Institution of Oceanography
Library, Mail Code C-075C
La Jolla, CA 92093

Hancock Library of Biology &
Oceanography
Alan Hancock Laboratory
University of Southern California
University Park
Los Angeles, CA 90089-0371

Gifts & Exchanges
Library
Bedford Institute of Oceanography
P.O. Box 1006
Dartmouth, NS, B2Y 4A2, CANADA

Office of the International
Ice Patrol
c/o Coast Guard R & D Center
Avery Point
Groton, CT 06340

NOAA/EDIS Miami Library Center
4301 Rickenbacker Causeway
Miami, FL 33149

Library
Skidaway Institute of Oceanography
P.O. Box 13687
Savannah, GA 31416

Institute of Geophysics
University of Hawaii
Library Room 252
2525 Correa Road
Honolulu, HI 96822

Marine Resources Information Center
Building E38-320
MIT
Cambridge, MA 02139

Library
Lamont-Doherty Geological
Observatory
Columbia University
Palisades, NY 10964

Library
Serials Department
Oregon State University
Corvallis, OR 97331

Pell Marine Science Library
University of Rhode Island
Narragansett Bay Campus
Narragansett, RI 02882

Working Collection
Texas A&M University
Dept. of Oceanography
College Station, TX 77843

Library
Virginia Institute of Marine Science
Gloucester Point, VA 23062

Fisheries-Oceanography Library
151 Oceanography Teaching Bldg.
University of Washington
Seattle, WA 98195

Library
R.S.M.A.S.
University of Miami
4600 Rickenbacker Causeway
Miami, FL 33149

Maury Oceanographic Library
Naval Oceanographic Office
Stennis Space Center
NSTL, MS 39522-5001

Marine Sciences Collection
Mayaguez Campus Library
University of Puerto Rico
Mayaguez, Puerto Rico 00708

Library
Institute of Oceanographic Sciences
Deacon Laboratory
Wormley, Godalming
Surrey GU8 5UB
UNITED KINGDOM

The Librarian
CSIRO Marine Laboratories
G.P.O. Box 1538
Hobart, Tasmania
AUSTRALIA 7001

Library
Proudman Oceanographic Laboratory
Bidston Observatory
Birkenhead
Merseyside L43 7 RA
UNITED KINGDOM

REPORT DOCUMENTATION PAGE	1. REPORT NO. WHOI-91-42	2.	3. Recipient's Accession No.
4. Title and Subtitle United States Electronic Chart Display and Information System (ECDIS) Test-Bed Project: System Requirements Specification.		5. Report Date August 1991	
7. Author(s) Carolyn K. Ocel and David J. Scott		8. Performing Organization Rept. No. WHOI-91-42	
9. Performing Organization Name and Address Woods Hole Oceanographic Institution Woods Hole, Massachusetts 02543		10. Project/Task/Work Unit No.	
		11. Contract(C) or Grant(G) No. (C) (G)	
12. Sponsoring Organization Name and Address U.S. Coast Guard, the American Petroleum Institute, American Telephone and Telegraph, Exxon Shipping Company and the Marine Spill Response Corporation		13. Type of Report & Period Covered Technical Report	
		14.	
15. Supplementary Notes This report should be cited as: Woods Hole Oceanog. Inst. Tech. Rept., WHOI-91-42.			
16. Abstract (Limit: 200 words) In 1989 the Maritime Safety Committee (MSC) of the International Maritime Organization (IMO) adopted a provisional performance Standard for ECDIS (MSC/Circ. 515). This standard defines an electronic chart display and information system (ECDIS) that is the legal equivalent of a paper chart, and that fulfills the requirement imposed on all vessels (reg. V/20 of SOLAS 1974) to carry up-to-date nautical charts covering intended voyages. The U.S. Electronic Chart Display and Information System (ECDIS) Test-Bed Project responds to the International Maritime Organization (IMO) call to member states to evaluate its Provisional Performance Standards for ECDIS. The central objective of the ECDIS Test-Bed Project is to assemble an experimental ECDIS unit that meets or exceeds the IMO standard, for evaluation on ships at sea. The first part of the project focussed on translating the IMO Provisional Performance Standard into an ECDIS system requirement specification, describing in an engineering context what an ECDIS must do to meet the standard. This task began with a document written by Mr. Mortimer Rogoff, of Digital Directions Co., and was carried to full detail and documentation by Ms. Carolyn K. Ocel and Mr. David J. Scott, of Intergraph Corporation. Their work was reviewed by members of the Consultative Group, the advisory body to our Project. The result of this process is contained in this report. Details of this ECDIS System Requirement Specification (SRS) will no doubt be disputed, as ambiguities, inherent contradictions, and the different priorities of various interested parties become manifest. This is an expected part of the standard setting process and we welcome it.			
17. Document Analysis a. Descriptors maritime transportation international maritime organization ECDIS b. Identifiers/Open-Ended Terms c. COSATI Field/Group			
18. Availability Statement Approved for public release; distribution unlimited.		19. Security Class (This Report) UNCLASSIFIED	21. No. of Pages 199
		20. Security Class (This Page)	22. Price